RELATIONAL COORDINATION APPLICATION TO PATIENT-PROVIDER, INTER-ORGANIZATIONAL, AND INTER-PROFESSIONAL RELATIONSHIPS

A Dissertation

by

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ABSTRACT

Fragmentation of healthcare in the United States has contributed significantly to the skyrocketing cost of care, poorer health outcomes, and higher rates of preventable hospitalizations compared to other industrialized nations. Addressing fragmentation requires improved coordination between patients and providers of care, across healthcare organizations, and across professionals. However, the issue with this proposed solution concerns the uncertainty surrounding how these different groups coordinate in achieving desirable outcomes for patients. Gittell's theory of Relational Coordination asserts that effective coordination is achieved through communication that is frequent, timely, and accurate involving shared goals, shared knowledge, and mutual respect. The Relational Coordination (RC) instrument is based upon this theory and has been applied to examine coordination between individuals in various healthcare settings. However, very few studies to date have directly applied RC to capture both perspectives of patient-professional relationships, relationships requiring coordination between individuals of different organizations, and relationships requiring coordination between two types of medical professionals. These three perspectives form the basis for the applications of RC for the purposes of the proposed study. All three study contexts take place within some aspect of the broader Texas Medicaid Waiver, each illustrating a different component of intra-agency or inter-agency relationships: the first paper applies RC to the intra-agency relationship between patients and professionals, the second paper applies RC to inter-organizational relationships between professionals and their partner

organizations, while the final paper applies RC to inter-professional relationships in the context of primary care and mental health integration. Overall, these papers will combine to provide a picture of how RC can be applied to coordination across a variety of healthcare related settings.

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Contributors Section

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NOMENCLATURE

RC	Relational Coordination
ED	Emergency Department
EMS	Emergency Medical Services
DSRIP	Delivery System Reform Incentive Payment
RMSEA	Root Mean Square Error of Approximation
LR	Likelihood Ratio
CFI	Comparative Fit Index
TLI	Tucker-Lewis Index
SRMR	Standardized Root Mean Residual

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CHAPTER I

INTRODUCTION

Fragmentation within the United States healthcare system has resulted in ineffective and more expensive care for its patients. To understand the extent of the inefficient care rendered, consider that the United States leads the world in per capita healthcare spending yet ranks 37th in the performance of its healthcare system according to the most recent World Health Organization rankings (World Health Organization, 2000). In a report comparing the U.S. with 10 other wealthy countries (Australia, Canada, France, Germany, the Netherlands, New Zealand, Norway, Sweden, Switzerland, the United Kingdom) on the dimensions of quality, access, efficiency, and equity, the United States ranked dead last overall despite outspending every country on this list by at least $3000 per capita (Davis et al, 2014). The fragmentation of healthcare provision is one of the major contributing factors to the lagging performance of the U.S. healthcare system (Elhauge, 2010).

Patient care improvements in US health care are increasingly premised on effective inter-professional coordination (Nembhard et al., 2006). Coordination is not new to health care. However, the Affordable Care Act and a general shift toward disease management have increased interest in such team-based initiatives as pathways, teamlet models, patient-centered medical homes, and accountable care organizations (Nielsen et al, 2012). In addition, for health care to be truly patient centered, patients must actively partner with their care coordinators to plan and coordinate care. The emphasis on

coordinated care both among health care professionals and between patients and professionals makes it increasingly important to understand what characterizes such coordination.

The increased emphasis on care coordination programs initiatives in the state of Texas have become more evident after 2012 with the launching of a statewide program shifting one million low income Medicare beneficiaries to a managed care plan operated by various insurance carriers. Based partially upon the savings precipitated by this shift to managed care, the Texas Medicaid 1115 (a) Healthcare Transformation Waiver ended up reallocating over $11 billion dollars to innovative projects proposed by hospitals, community mental health centers, and other providers, specifically through the Delivery System Reform Incentive Payment (DSRIP) pool (Texas Health and Human Services Commission, 2012). The Waiver program stipulated that providers participate in a regional healthcare partnership in order to receive DSRIP payments. Although the focus is on the underserved, the Waiver is intended to improve Texas's health care system as a whole, largely through improved coordination among these hospitals, community mental health centers, and assorted providers. Specifically, the three goals of this Waiver are providing better quality of care, improving the health of the population served, and curbing cost of care rendered to this Medicaid population.

The triple aim of the Waiver pertaining to quality, health, and cost involves partially remedying the systemic fragmentation across providers and healthcare organizations through the implementation of programs such as care coordination. Relational Coordination can achieve desired outcomes under the conditions of reciprocal

dependence, task and input uncertainty, and time constraints (Gittell, 2012). When tasks are reciprocally interdependent, each individual's actions affect and are likewise affected by the other's actions (Gittell, 2012). Gittell conceptualizes Relational Coordination as operating through a network of communication ties among participants who interdependently transform inputs into outcomes of value for the organization (Gittell, 2011). Thus, the quality of communication and relationships amongst participants is as salient as the technical requirements of the work.

Specifically, Gittell's theory asserts that effective coordination is achieved through communication that is frequent, timely, and accurate, as well as involving shared goals, shared knowledge, and mutual respect (Gittell, 2005). Shared goals ensure aligned interests; shared knowledge allows participants to understand how their specific tasks fit within the overall process; and mutual respect enables participants to overcome status barriers that might otherwise prevent them from taking others' perspectives into account (Gittell, 2011).

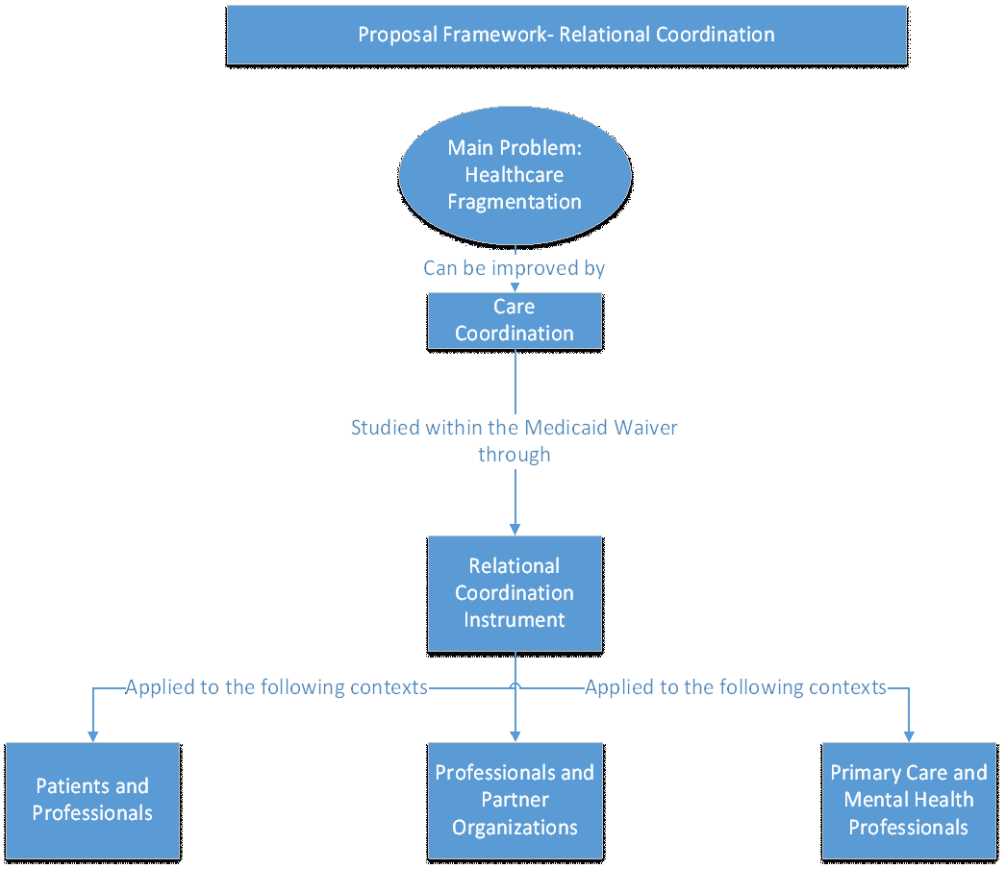
Thus, the following three studies in this dissertation will examine Relational Coordination in three different types of dyads within the context of two types of DSRIP projects stemming from the broader Texas Medicaid Waiver transcending both organizational and professional boundaries. These include the patient-professional (Chapter III), professional-key partner (inter-agency) (Chapter IV), and the primary care professional and mental health inter-professional relationship (Chapter V). Each of these three studies signifies a key piece of the healthcare fragmentation puzzle addressed by Relational Coordination. The main focus lies on patient-centered care through

coordination between the patient and professional along with improved coordination across both the organizational and professional boundaries that will ultimately improve the quality of care received by the patient.

I.1 Theoretical Framework

Figure 1 represents an overarching theoretical framework guiding this dissertation. The central purpose of this dissertation involves addressing the problem of healthcare fragmentation through studying the quality of coordination in different healthcare contexts. Enhanced coordination represents one of the key elements of the Texas Medicaid Waiver. The method of studying care coordination across these projects in this particular study is the Relational Coordination (RC) instrument. The RC was applied across three settings: patient-provider, professionals and their key partners, and integration across primary care and mental health professionals. Overall, the RC instrument examines care coordination across three different contexts of healthcare all of which are critical in ameliorating the system-wide problem of fragmentation.

Figure 1: Theoretical Framework for Relational Coordination



CHAPTER II

METHODS RELATIONAL COORDINATION INSTRUMENT

Relational Coordination has been applied extensively across a variety of health care settings. For instance, higher quality relational coordination between formal care providers have been associated with better post-surgical outcomes for joint replacement patients (Gittell, 2000). Relational coordination between formal providers and informal caregivers was also associated with caregiver preparation, provision, and management of care, implying that coordination contributed significantly to the measured outcomes (Weinberg et al., 2007). Another example of RC's utility involves patient portal networks- systems designed to spur patient involvement in their own health by giving secured access to personal medical records, allowing them to communicate directly with providers and increasing access to self-management tools. Relational coordination has enhanced performance within patient portal networks by mitigating challenges caused by lack of organizational and technological proximity thereby reducing its associated cost of coordination (Otte-Trojel et al, 2016) The Relational Coordination (RC) instrument is one of the main validated measures of coordination in health care that may be applied in situations where teams encompass disciplinary and organizational boundaries (Valentine et al., 2013). Thus, the RC instrument was applied to the following coordination scenarios: patient-care coordinator, care coordinator-key partner, and primary care professional-mental health professional.

II.1 Measures

The following variables used in these analyses stem from the RC instrument: frequency, timeliness, accuracy, problem-solving (split into two items in a few of the analyses), shared goals, shared knowledge, and mutual respect. In addition, two other items were used: (1) a prefatory question about how often professionals and patients thought they needed help (which is named 'dependence') and (2) an item about mutual influence previously found to load well onto Relational Coordination (which is named 'influence') (Weinberg, 2007).

In consultation with Gittell, some of the item wording of the instrument was altered to allow consistent response options using the Likert-like scale. The coding for the responses on the Likert scale involved the following convention: 0=Never, 1= Rarely, 2=Some of the time, 3= Most of the time, 4= All of the time.

The original question for the problem-solving variable asked the patient whether the care coordinator worked with them to solve the problem or blamed others. Since the question could not be answered and coded clearly through the Likert-like scale, this necessitated splitting Work Together into two different questions, one related to blaming (named blame for the rest of this paper) and the other to working together (named work together for the rest of this paper).

II.2 Confirmatory Factor Analyses

II.2.1 Background and Theory

Factor analysis comes in one of two forms: exploratory and confirmatory. In these studies, confirmatory factor analyses were utilized instead of exploratory factor analyses for three reasons. The first reason involves the RC instrument itself and the specifically established expectation that all of the seven original RC items load reliably onto one construct measuring quality of care coordination. In addition, there is an expectation the RC factor correlates highly with a separate factor (influence). In exploratory factor analysis, there are no specific expectations outlined while confirmatory factor analysis (CFA) allows for a theory to be directly tested (Thompson, 2004). In this case, RC reflects a theory of coordination which suggests quality of coordination contains the components of frequency, timeliness, accuracy, problem-solving, shared knowledge, mutual respect and shared goals.

In addition, CFA is more appropriate since the theory of coordination can be directly tested by the analysis and the degree of model fit can be quantified in various ways (Thompson, 2004).

Finally, in CFA, there are no specific requirements concerning factor correlations- they can be correlated or uncorrelated. In EFA, all of the factors must be correlated or all uncorrelated before running analyses (Thompson, 2004). In these studies, influence is expected to be correlated with Relational Coordination. Thus, CFA allows for the flexibility needed in terms of the correlation of factors to conduct these studies.

II.2.2 Polychoric Correlation Diagnostics

Before conducting factor analyses, it is imperative to understand the degree of association between variables as well as aligning the appropriate correlation with the ordinal nature of the data. As mentioned earlier, a Likert-like scale has been utilized for each of the items in RC which involves ordinal data. This means a conventional Pearson correlation is inappropriate since it assumes interval scales of measurement rather than ordinal scales. Due to this assumption, the relationship between measures would be artificially restricted due to the restrictions imposed by categorization as all subjects within the interval limiting each of the categories would be classified within the same category receiving the same score (Gilley and Uhlig, 1993). Consequently, the data variability would be severely limited.

Moreover, the polychoric correlation coefficient would be suitable for this data. Polychoric correlation is a measure of association for ordinal variables which assumes an underlying joint continuous distribution (Ekstrom, 2011). When dealing with ordinal data, the variance-covariance matrix is utilized by polychoric correlations as the weighting element for the correlation estimation process which limits bias in comparison to the Pearson correlations (Bollen, 1989). Furthermore, when using CFA, regardless of sample size and population correlations, polychoric correlations with a maximum likelihood provides the most consistent and robust correlation estimates (Jöreskog and Sörbom, 1996).

In addition, the polychoric matrix serves diagnostic purposes due to the fact that the covariance matrix must be free of the following problematic elements before

conducting factor analysis to ensure convergence and the subsequent estimation of a model: negative values, perfect collinearity, or lack of correlation coefficient generated altogether. In order to use maximum likelihood for any structural equation modeling such as CFA, the correlation matrix cannot contain negative values (Uebersax, 2006). In addition, one of the assumptions of any factor analysis involves no perfect collinearity (e.g. no perfect correlations) which generates singularity which prevents rotation of a matrix and does not allow a solution to form (Garson, 2013). Due to the ordinal Likert-like nature of the data, all of the analyses in this dissertation started with a diagnostic polychoric correlation to determine whether there were any items that were perfectly correlated, negatively correlated, or could not generate correlation estimates. In each case, the items were removed since they prevented the data from converging and a CFA model from being estimated.

II.2.3 Confirmatory Factor Analysis Context Summary

Confirmatory factor analysis was used in each of the aforementioned three relationships in which the initial hypothesis was that all of the seven original RC items (Frequency, Timeliness, Accuracy, Problem Solving, Shared Goals, Shared Knowledge, and Mutual Respect) loaded well on a construct known as quality of coordination (Gittell, 2003).

Chapter III concerns the patient and professional relationship. Thus, there were four sets of factor analyses conducted. The first set is specific to patient responses to the RC instrument. The next three sets of factor analysis were run specific to the most benefitted patient, typical patient, and least benefitted patient.

Chapter IV involves the professional-key partner relationship. There were two sets of factor analyses conducted- one relating to the care coordinators and the other relating to the key partners identified by these care coordinators.

Chapter V centers on the primary care professional and mental health professional relationship. There were two sets of factor analyses conducted- one relating to the primary care professional and the other relating to the mental health professional at each site.

II.2.4 Confirmatory Factor Analysis Statistics

Various statistical indices were utilized for the purposes of CFA. The first statistic involves the Cronbach alpha coefficient which examines reliability of the data. The Cronbach alpha coefficient that exceeds 0.8 will serve as a conventional threshold for an acceptable value (Liu, 2003). In the case that Cronbach alpha values do not exceed 0.8, the item which most adversely affects the overall alpha value was removed. This process was repeated until the alpha value either exceeded 0.8 or could not be maximized any further. These alpha coefficients were reported for each round of the data. In addition, the loading factors for each variable in each round of data were taken into consideration. Just like correlation coefficients, loading factors range from 0 to 1 and help determine how well the item predicts the response from the underlying variable (which in this case denotes Relational Coordination). A loading factor of 0.4 for each item in the factor is suggested for confirmatory factor analysis (Ugulu, 2013). Thus, this factor analysis process involved removing any items with low loading factors <0.4) from the analysis.

Along with the Cronbach's alpha and loading factors, the following indices were reported in this portion of the results section for each CFA iteration: Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), and Tucker-Lewis Index (TLI), and Standardized Root Mean Residual (SRMR). In order to minimize Type I and Type II errors, the acceptable thresholds for each of the indices are the following: RMSEA < 0.06, CFI > 0.90, TLI > 0.90, SRMR < 0.08 (Hu and Bentler, 1999). These fit indices values were used to assess appropriateness of the models ran sequentially using backward regression (starting with all of the items in the model, removing any items that are not significant, and refitting the modified model). They all lend insight on the structural fit of the data in relation to the theorized model. Since RMSEA and SRMR are inflated when the sample sizes are small (as was the case in the three contexts), the CFI and TLI were emphasized since they are not dependent on sample size.

II.3 Means Comparisons

II.3.1 Chapter III Patient and Professional Relationship

In Chapter III, two sets of analyses were conducted. The first set of analyses involved the comparison of the mean responses for the RC instrument administered to the care coordinators for each of the variables across the three different types of patients (most benefitted, typical, and least benefitted). This analysis was done in order to determine whether the perceived quality of coordination from the perspective of the care coordinator differed amongst the three types of patients. The second set of analyses involved the comparison between the "typical" patient and the care coordinator mean responses in order to determine whether there was a substantive difference in the

perception of the quality of care coordination between patients and care coordinators. The "typical" patient from the care coordinator perspective is utilized for this latter comparison because it captures the most representative experience of care navigation which can be compared to the average patient response from the RC instrument administered to the patients.

II.3.2 Chapter IV Professional-Key Partner Relationship

In Chapter IV, the mean care coordinator and key partner responses were compared across each of the variables in the instrument. This was done in order to determine whether there was a substantive difference in the reciprocal perceptions of care coordination quality between the two types of agencies.

II.3.3 Chapter V Primary Care Professional and Mental Health Professional Relationship

In Chapter V, this analysis involves the comparison of the mean responses of the primary care and mental health professionals across each of the variables in the RC instrument. This was done in order to determine whether there was a substantive difference in the reciprocal perceptions of care coordination quality between the two types of medical professionals.

II.3.4 Means Comparison Analysis

Since the sample size of the data was small in each of the studies, no significance testing was conducted to compare the means. For both sets of analyses, the mean difference exceeding one unit on the Likert scale ranging from 0 to 4 was considered as a substantive difference. This mean difference of one unit was sufficient to cross between categories (e.g. 'some of the time' to 'most of the time').

II.4 Invariance Testing Analyses

In Chapter III, invariance testing was conducted with the CFA involving the language in which the survey was administered (English versus Spanish) and the education level of the patients administered the RC instrument (those who have not completed high school versus those who at least completed high school). The purpose of this invariance testing entails accounting for the diversity in the sample and seeing how well the RC scale loads when applied to situations where it is administered in Spanish or those with little formal education.

CHAPTER III

INTRA-AGENCY PATIENT AND PROFESSIONAL RELATIONAL COORDINATION

III.1 Introduction

Fragmentation in the provision of care has compromised the quality of care rendered and led to more adverse outcomes for patients. Health care today is increasingly premised on partnerships between patients and their providers. For instance, patient centered care is defined as care that is sensitive to individual patient preferences and needs, thereby ensuring that patient values guide all clinical decisions (Berwick, 2009). In one recent study, patients reporting higher levels of patient-centered care had a decreased likelihood of delayed care and less frequent visits to the ED (Alexander, Hearld, Mittler, & Harvey, 2012).

Aligned with this theme of providing patient centered care, one common type of project within Texas's Medicaid 1115 Waiver has been patient care coordination often explicitly focused on or logically positioned to reduce over-reliance on emergency departments (ED). Past studies indicated the efficacy of care coordination in curbing ED readmission rates in urban hospitals (Corbett et al., 2005) and spurring primary care use (Horwitz et al., 2005). A variety of other Waiver-funded projects have similarly emphasized elements of care coordination, such as care transitions and mental health-primary care integration, also intended to move care to more preventive settings. However, even with the emphasis on the patient, the efficacy of coordination occurring

between patients and their care coordinators is unclear. Without understanding how well the patient perceives the quality of interaction from their care coordinator and how well the care coordinator perceives the quality of interaction with the patient, the effectiveness of care coordination within this patient-provider context cannot be gauged.

The purpose of this study is to investigate the relationship between patients and care coordinators. To achieve this purpose, the study will involve applying the RC instrument and measure how patients and care coordinators perceive one another. Relational Coordination has been applied extensively across a variety of health care settings. For instance, higher quality relational coordination between formal care providers have been associated with better post-surgical outcomes for joint replacement patients (Gittell, 2000). Relational coordination between formal providers and informal caregivers was also associated with caregiver preparation, provision, and management of care, implying that coordination contributed significantly to the measured outcomes (Weinberg et al., 2007). However, very few studies have captured the healthcare provider perspective on the patient.

Using the RC instrument, one study found that when families of autistic children reported better coordination with formal providers experienced lower parenting stress and better family functioning (Warfield et al., 2014). The RC instrument can be applied in situations involving reciprocal dependence, task and input uncertainty, and time constraints. Most studies have focused on the patient perception pertaining to the quality of interactions between the patient and providers. Thus, in order to capture the quality of coordination in a situation involving reciprocal dependence, it is imperative to capture

both perspectives. Reciprocal dependence is a situation where outputs of one actor become inputs for another. Under conditions of reciprocal dependence, each actor involved is dependent upon the other with each unit posing contingency for the other (Thompson, 1967). A pertinent example of reciprocal dependence in healthcare involves hospitals through their coordinated services given to patients (Daft, 2007). Specifically, a patient admission into a hospital for a knee replacement operation moves between the radiology, surgery, intensive care unit, medical/surgical floor, and physical therapy departments. In order to procure a high level of coordination between these actors, a horizontal organizational structure and teams are necessary to foster the open and frequent communication necessary to expediently handle any issues that may surface during the care of a patient needing a knee replacement operation (Borkowski, 2015).

This study attempted to record both sets of perceptions. Due to privacy concerns, the care coordinators cannot provide their perceptions of a specific patient, thus, the perceptions are not directly reciprocal. However, the perceptions from both the patient were aggregate across all individuals within each group. Thus, the patient perceptions of the care coordinators were recorded and averaged across all the sites. Moreover, the care coordinator perceptions pertaining to the patients were not assessments of the quality of their interactions with specific patients within the sites. Instead, they were asked to recall and assess the quality of interactions with three types of patients: a patient who least benefitted from care navigation, a typical patient within care navigation, and the most benefitted patient from care navigation. Thus, this study involved testing the

RC scale's external validity to patients and their relationship with care coordinators. Specifically, it involved answering the following two questions:

1) How does Relational Coordination apply to a diverse group of patients and their relationship with the care coordinators?
2) How does patient perception of care coordinators compare to care coordinator perception of patients?

III.1.1 Background

Relational forms of coordination have generally focused on the quality of communication and relationships amongst participants (Gittell, 2005). As mentioned earlier, coordination can achieve desired outcomes under the conditions of reciprocal dependence, task and input uncertainty, and time constraints. This requires a high degree of relational coordination for mutual adjustment (Gittell, 2012). Gittell conceptualizes relational coordination as operating through a network of communication ties among participants who interdependently transform inputs into outcomes of value for the organization (Gittell, 2011). Thus, the quality of communication and relationships amongst participants is as salient as the technical requirements of the work. Health care organizations have turned to coordination and the management of task interdependencies to improve patient quality of care and clinical outcomes (Gittell, 2000).

Assessing the ability of these patient centered initiatives to spur coordination and improve holistic care requires understanding of coordination functioning. The quality of the patient-care coordinator relationship (and accompanying patient outcomes) is shaped

by the perception of the patient on how well the care coordinator interacts with them as well as the perception of the care coordinator on how well the patient interacts with them. In one study examining the effects of HIV-positive patient perception of physicians on patient outcomes, the patient perception of the care coordinator knowing them as a person was significantly and positively associated with receiving highly active anti-retroviral therapy (HAART), adhering to HAART, and having undetectable serum HIV RNA (Beach et. al, 2006). In addition, favorable HIV-positive patient perceptions of physician communication have been linked to better adherence to anti-retroviral medications (Roberts, 2002 and Schneider et. al, 2004). Furthermore, using the Relational Coordination instrument, a study found that families of autistic children who reported better coordination with formal care coordinators experienced lower parenting stress and better family functioning (Warfield et al., 2014).

Before delving into the study of patient-care coordinator interactions, it is imperative to understand the importance and the effects of these interactions between patients and providers. One study demonstrated that physicians generally overestimated patient literacy levels more often with minority patients indicating a potential source of disparities in healthcare (Kelly et al, 2007). A similar theme of healthcare disparities emerged in another study which determined physician perception of nonadherence strongly correlated with a delay in prescribing recommended medications particularly amongst poor, women, and Latinos *(*Wong et al., 2004). These studies underscore the importance of provider perceptions of patients in terms of its influence on practice patterns which may adversely shape patient outcomes. These healthcare disparities

perhaps stem from the inherent barriers of communication between the patient and provider which manifest in a tenuous relationship between the parties. As mentioned earlier, relational coordination focuses on the quality of communication between participants. Since healthcare disparities hamper the quality of communication and accompanying relationship between the patient and provider, it serves an important role in understanding the broader picture of relational coordination between the patient and provider.

Moreover, very few studies have examined both the care coordinator and patient perspective in the same study and none have used the RC instrument to assess both sets of perceptions. Thus, the purpose of this study entailed examining the coordination occurring between patients and care coordinators through the use of the RC instrument to capture both sets of perceptions.

III.2 Methods

III.2.1 Sample

Data for the patient perception of the care coordinator portion of the study were collected in 2014 through the phone administration of the RC instrument to patients through 18 sites, including nine that did not have ED-focused patient care coordination funded through the Waiver, but typically had a range of other care coordination initiatives. The patient phone instrument was administered in the winter 2014 of to 666 patients of which 187 patients reported receiving care coordination (Cohort 1). Cohort 1 would also include the 80 patients from two sites (3 and 7) who were interviewed a little past December 2014. The patient phone instrument data was collected again between

February and March 2016 in which 159 patients reported receiving care coordination from 13 sites (Cohort 2). The participation rate for patients in Cohort 2 was 30%. Both cohorts were utilized and pooled in these analyses to obtain a robust enough sample size for the use of confirmatory factor analyses (CFA). The Relational Coordination scale items were only administered to those who reported having a care coordinator. Patient Cohort 1 involved certain facilities sending rosters of the care coordination patients (in DSRIP sites) and frequent ED users (in comparison sites). In case neither could be obtained in some of the sites, Medicaid enrollment files were used instead to recruit patients.

As for Patient Cohort 2, rosters of frequent ED users were provided by the participating facilities in both the DSRIP sites where care navigation was conducted as well as the comparison sites.

Table 1 below summarizes the characteristics of the individual patient cohorts who reported receiving care navigation as well as the combined sample:

Table 1: Background Attributes of Patients: Cohorts 1 and 2

Patient Information	Cohort 1 (n=167)	Cohort 2 (n=159)	Combined Sample (n=326)
	Mean or %	Mean or %	
Age	48.19	50.89	49.51
Male	31%	42%	37%
Race/Ethnicity			
Hispanic	53%	53%	53%
Non-Hispanic White (exclusive)	19%	19%	19%
Non- Hispanic Black/African American	26%	26%	26%
Other	2%	2%	2%
Education			
No GED or high School	36%	30%	32%
GED	11%	8%	9%
High school	23%	28%	25%
Some college/Associates	24%	26%	26%
College degree	6%	7%	7%
Insurance Type			
None	28%	28%	28%
Medicaid only	17%	17%	17%
Medicare only	9%	9%	9%
Dual Eligibility	17%	17%	17%
Other (Private/Military/Multiple)	29%	29%	29%
Other Characteristics			
Live alone	22%	22%	22%
Work outside the home	20%	20%	20%
Work part-time (of those who work outside the home)	55%	60%	60%
Health Conditions			
Hypertension	68%	72%	70%
Diabetes	45%	54%	50%
COPD	23%	27%	27%

Table 1 Continued	Cohort 1 (n=167)	Cohort 2 (n=159)	Combined Sample (n=326)
Self-Reported Health Conditions			
Asthma	28%	28%	28%
Bipolar Depression	17%	N/A	17%
Schizophrenia	9%	N/A	9%

The second part of this study involves the care coordinators at each site who served as a liaison for the patients helping them access necessary medical and social services. In these sites, care coordinators represented a diverse body of professionals which included paramedics, nurses, and social workers. There were 12 care coordinators within the ten DSRIP-funded patient care coordination projects who completed the RC instrument. The RC instrument was administered to these 12 care coordinators between December 2015 and May 2016. The care coordinators were first asked to recall a patient who benefitted the least from care navigation, a patient with a typical experience in care navigation, and a patient who benefitted the most from care navigation. Then the care navigator was asked to answer the RC items separately for each of the three types of patients.

Table 2 below outlines the original item wording of the questions from the RC instrument, the item wording of the questions administered to the patient, and the item wording of the questions administered to the care coordinators.

Table 2: Patient and Care Coordinator Relational Coordination Instrument Wording

Variable	Original wording of the question (Gittell,2011)	Wording of the question as given to the patients in this study	Wording of the question as given to the care coordinators of this study
Dependence (Not part of Confirmatory Factor Analysis)	(not part of Relational Coordination scale) -Pertains to the extent the individual needed help from the other person. -Does not relate to quality of care coordination when the extent of dependence is low.	How often do you need information from (title of care coordinator) to manage (control) your health condition?	How often do you need information from the patient to help manage their health?
Frequency	How frequently do people in each of these groups communicate with you about (insert focal work process/client population)?	When you need that information from (title of care coordinator), how often do you get it?	When you need information from the patient, how often do you get it?
Timeliness	Do they communicate with you in a timely way about (insert focal work process/client population)?	How often does (title of care coordinator) give you information (to manage your health condition) as quickly as you need it?	How often does the patient give you information as quickly as you need it?
Accuracy	Do they communicate with you accurately about (insert focal work process/client population)?	How often do you think the information (title of care coordinator) gives you is accurate (correct, good information)?	How often do you think the information the patient gives you is accurate?

Table 2 Continued

Variable	Original wording of the question (Gittell,2011)	Wording of the question as given to the patients in this study	Wording of the Question as given to the care coordinators of this study
Problem Solving	When there is a problem with (insert focal work process/client population), do people in each of these groups blame others or work with you to solve the problem?	Work Together When there is a problem, how often does (title of care coordinator) work with you to solve the problem? Blaming When there is a problem, how often does she [he] work with you to solve the problem?	Work Together When there is a problem, how often does the patient work with you to solve the problem?
Shared Goals	Do people in each of these groups share your goals for (insert focal work process/client population)?	How often does (title of care coordinator) have the same goals as you do for managing your health (taking care of your health)?	How often does the patient have the same goals as you do for managing their health?
Shared Knowledge	Do people in each of these groups know about the work you do with (insert focal work process/client population)?	How often does (title of care coordinator) know about the work you do to manage your health (take care of your health)?	How often does the patient know about the work you do?
Mutual Respect	Do people in each of these groups respect the work you do with (insert focal work process/client population)?	How often does (title of care coordinator) respect the work you do to manage your health (take care of your health)?	How often does the patient respect the work you do?
Influence	(Developed by Dana Weinberg; not part of original Relational Coordination scale)	How often do you have a say in what (title of care coordinator) does about managing your health care?	How often do you have a say in what patients do to manage their health?

The data were collected from the across the sites through the patient instrument administered over the phone as well as the instrument administered to the care coordinators in person.

The patient administration of the instrument over the phone generally took about 30 minutes to complete. The patients were first asked about whether they remembered receiving any kind of assistance from the care coordinator(s) at the specific site in the study. Only the patients who mentioned receiving assistance were included in the subsequent analyses. In addition to the RC questions, they were asked questions concerning their rights as a patient and access to necessary education, their psychological, emotional, and physical status through the SF8 inventory, and self-reported diagnosis of specific chronic and psychosomatic illnesses.

As for the care coordinator administration of the instrument in person at each site, the care coordinators were first asked to jot down available information about the most benefitted patient in their care navigation while maintaining the anonymity of the patient. This information included the payer type, when they last used the ED, demographic information (age, sex, and residence status), medical information (diagnoses and what kind of services they received), and whether or not they received any type of transportation and social service assistance. The care coordinators were also probed about the outcomes as a result of the care navigation for this patient. After obtaining all this information, the RC instrument (present on the far-right side of Table 2) was administered to the care coordinator. The process was repeated for both the "typical" patient as well as the least benefitted patient.

III.3 Results

III.3.1 Polychoric Correlations Care Coordinator Perspective of Least Benefitted Patient

The polychoric correlations from Table 3 below indicate that frequency and timeliness exhibit a correlation of 1.0 which denotes perfect collinearity. This perfect collinearity prevents any model from being estimated. Thus, Frequency was removed from further CFA analyses since its correlations with other items were weaker on average than that of Timeliness. In addition, Shared Goals and Accuracy exhibited a perfect correlation to one another in which Accuracy was removed since its correlations with other items were weaker on average than that of Shared Goals. Consequently, the remaining items that comprised the first CFA iteration for the care coordinator perspective of the least benefitted patient include Timeliness, Work Together, Shared Knowledge, Mutual Respect and Shared Goals.

Table 3: Polychoric Correlations for Care Coordinator Perspective on Least Benefitted Patient (n=12)

Variable	Frequency	Timeliness	Accuracy	Work Together	Shared Knowledge	Mutual Respect	Shared Goals
Frequency	1.00						
Timeliness	**1.00**	1.00					
Accuracy	0.87	0.90	1.00				
Work Together	0.81	0.96	0.93	1.00			
Shared Knowledge	0.67	0.63	0.65	0.67	1.00		
Mutual Respect	0.65	0.82	0.75	0.95	0.73	1.00	
Shared Goals	0.87	0.92	**1.00**	0.95	1.00	0.94	1.00

III.3.2 Polychoric Correlations Care Coordinator Perspective of Typical Patient

The polychoric correlation matrix displayed in Table 4 indicated a perfect correlation between Frequency and Timeliness which meant Frequency was removed from the CFA analysis because it exhibited lower correlations on average with the other items than Timeliness. Thus, the initial iteration of the CFA model for the care coordinator perspective of the typical patient contained the following items: Timeliness, Accuracy, Work Together, Shared Knowledge, Mutual Respect, and Shared Goals.

Table 4: Polychoric Correlation Matrix for Care Coordinator Perspective on Typical Patient (n=12)

Variable	Frequency	Timeliness	Accuracy	Work Together	Shared Knowledge	Mutual Respect	Shared Goals
Frequency	1.00						
Timeliness	**1.00**	1.00					
Accuracy	0.55	0.73	1.00				
Work Together	0.68	0.74	0.81	1.00			
Shared Knowledge	0.48	0.73	0.48	0.42	1.00		
Mutual Respect	0.35	0.58	0.24	0.22	0.80	1.00	
Shared Goals	0.49	0.64	0.67	0.68	0.47	0.70	1.00

III.3.3 Polychoric Correlations Care Coordinator Perspective of Most Benefitted Patient

The polychoric correlation matrix displayed in Table 5 indicates a perfect correlation between Work Together and Shared Goals which meant Work Together was removed from the CFA analysis because its correlations with other items were weaker on average than that of Shared Goals. In addition, Frequency and Accuracy failed to register a correlation within the matrix which meant Frequency was removed because of its near perfect correlation (0.99) with Timeliness coupled with two correlations below 0.5 with the Shared Knowledge and Mutual Respect items. Thus, the initial iteration of CFA for the care coordinator perspective on the most benefitted patient contained the following items: Accuracy, Timeliness, Shared Knowledge, Mutual Respect, and Shared Goals.

Table 5: Polychoric Correlation Matrix for Care Coordinator Perspective on Most Benefitted Patient (n=12)

Variable	Frequency	Timeliness	Accuracy	Work Together	Shared Knowledge	Mutual Respect	Shared Goals
Frequency	1.00						
Timeliness	0.99	1.00					
Accuracy	.	0.87	1.00				
Work Together	0.93	0.78	0.70	1.00			
Shared Knowledge	0.47	0.61	0.51	0.77	1.00		
Mutual Respect	0.42	0.76	0.40	0.42	0.88	1.00	
Shared Goals	0.78	0.71	0.77	**1.00**	1.00	0.76	1.00

III.3.4 CFA for Care Coordinator Perspective on Least, Typical and Most Benefitted Patients

After performing the polychoric correlation diagnostics to remove problematic items, CFA was conducted with the remaining items for the care coordinator perspective on the least, typical, and most benefitted patients. The results for all of the iterations for the care coordinator perspective on each of the three types of patients are displayed on Table 6.

Table 6: CFA Results for Care Coordinator Perspective on Least, Typical, and Most Benefitted Patient (n=36)

	Least		Typical			Most	
Reliability Scale	**First Iteration Value**	**Second Iteration Value**	**First Iteration Value**	**Second Iteration Value**	**Third Iteration Value**	**First Iteration Value**	**Second Iteration Value**
Cronbach Alpha	0.93	0.95	0.85	0.84	0.84	0.85	0.84
Item	**Loading Factor**		**Loading Factor**			**Loading Factor**	
Frequency	Removed Prior to CFA		Removed Prior to CFA			Removed Prior to CFA	
Timeliness	0.89	0.89	0.83	0.84	0.79	0.73	0.66
Accuracy	Removed Prior to CFA		0.64	Removed	Removed	0.6	Removed
Work Together	0.98	0.99	0.65	0.53	Removed	Removed Prior to CFA	
Shared Knowledge	0.62	Removed	0.74	0.82	0.86	0.8	0.85
Mutual Respect	0.98	0.9	0.65	0.73	0.79	0.78	0.83
Shared Goals	0.85	0.82	0.74	0.67	0.61	0.76	0.71
Measures	**Fit Value**		**Fit Value**			**Fit Value**	
RMSEA	0.28	0.17	0.28	0.33	0.23	0.2	0
CFI	0.92	0.99	0.72	0.74	0.93	0.89	1
TLI	0.83	0.96	0.54	0.48	0.79	0.78	1.18
SRMR	0.06	0.03	0.12	0.1	0.05	0.08	0.03
P-value of LRT	0.08	0.27	0.04	0.04	0.2	0.19	0.58

III.3.5 CFA for Care Coordinator Perspective on Least Benefitted Patient

The first iteration of the CFA model for the care coordinator perspective of least benefitted patient began with Timeliness, Work Together, Shared Knowledge, Mutual Respect and Shared Goals. While the Cronbach alpha value was above 0.8 and all of the loading values exceeded the desired threshold of 0.4, only two of fit indices satisfied the

desired thresholds (CFI > 0.90 and SRMR < 0.08). Consequently, Shared Knowledge was removed since it exhibited the lowest loading factor in the first iteration. The second iteration contained the following items: Timeliness, Work Together, Mutual Respect and Shared Goals. In the second iteration, the Cronbach alpha was above 0.8, all of the loading factors exceeded 0.4, and three of the fit indices satisfied the desired thresholds (TLI> 0.9, CFI > 0.90 and SRMR < 0.08). Furthermore, the high p-value (p>0.05) suggests there is no difference between the patterns observed in these data and the specified model for this third iteration. As a result of all these desirable values, no further iterations were needed. Thus, the final model for the care coordinator perspective on the least benefitted patient includes the following: Timeliness, Work Together, Mutual Respect, and Shared Goals.

III.3.6 CFA for Care Coordinator Perspective on Typical Patient

The first iteration for the care coordinator perspective of the typical patient contained Timeliness, Accuracy, Work Together, Shared Knowledge, Mutual Respect, and Shared Goals. Though the loading factors and Cronbach alpha value exceeded the desired thresholds, none of the fit indices exceed the acceptable threshold values. As a result, the Accuracy item was removed due to it exhibiting the lowest loading factor in the first iteration. Thus, the second iteration contained the following items: Timeliness, Work Together, Shared Knowledge, Mutual Respect, and Shared Goals. Once again, the loading factors and Cronbach alpha value exceeded the desired thresholds, but none of the fit indices exceed the acceptable threshold values. As a result, the Work Together, item was removed due to it exhibiting the lowest loading factor in the second iteration.

Thus, the third iteration of CFA included the following items: Timeliness, Shared Knowledge, Mutual Respect and Shared Goals. The Cronbach alpha exceeded 0.8 and all of the loading factors exceeded 0.4 while two of the fit indices exhibit acceptable values (CFI > 0.90 and SRMR < 0.08). Furthermore, the high p-value (p>0.05) suggests there is no difference between the patterns observed in these data and the specified model for this third iteration. Therefore, no further iterations were needed. Therefore, the final model for the care coordinator perspective on typical patients contains Timeliness, Shared Knowledge, Mutual Respect and Shared Goals.

III.3.7 CFA for Care Coordinator Perspective on Most Benefitted Patient

The first CFA iteration for the care coordinator perspective of the most benefitted patient contained Accuracy, Timeliness, Shared Knowledge, Mutual Respect, and Shared Goals. All of the loading factors exceeded 0.4 while only one of the fit indices exhibited satisfactory values (SRMR < 0.08). Thus, the Accuracy item was removed because it exhibited the lowest loading factor in the first iteration. The second iteration contained the following items: Timeliness, Shared Knowledge, Mutual Respect and Shared Goals. In the second iteration, the Cronbach alpha value exceeded 0.8, all of the loading factors exceeded 0.4 while all the fit indices exhibited satisfactory values (RMSEA < 0.06, CFI > 0.90, TLI > 0.90, SRMR < 0.08). In addition, the high p-value (p>0.05) suggests there is no difference between the patterns observed in these data and the specified model for this second iteration. Thus, no further iterations were necessary. The final model for the care coordinator perspective of the most benefitted patient

included the following items: Timeliness, Shared Knowledge, Mutual Respect and Shared Goals.

III.3.8 CFA RC + Influence Item for Care Coordinator Perspective on the Least Benefitted, Typical, and Most Benefitted Patients

After obtaining the final model for the RC items for the care coordinator perspective on the least benefitted patient, typical patient, and most benefitted patient, the hypothesis of influence being correlated with the remaining RC items was tested. This is to validate the consistent finding of influence item loading well onto the RC scale as in previous studies. This was done by examining how well influence loads onto the final structure in these contexts for the care coordinator perspective on the least benefitted patient, typical patient, and most benefitted patient. Based on the final model of the care coordinator perspective of the least benefitted patient, typical patient, and most benefitted patient, further CFA analyses were conducted with the influence item developed by Dana Weinberg. Table 7 displays the results of the influence item with the final models of the care coordinator perspective of the least benefitted patient, typical patient, and most benefitted patient.

Table 7: CFA Results for Care Coordinator Perspective on Least, Typical, and Most Benefitted Patient w) Influence Item (n=36)

Reliability Scale	**Least Benefitted Patient**	**Typical Patient**	**Most Benefitted Patient**
Cronbach Alpha	0.96	0.89	0.86
Item	**Loading Factor**		
Frequency	Removed Prior to CFA	Removed Prior to CFA	Removed Prior to CFA
Timeliness	0.89	0.76	0.71
Accuracy	Removed Prior to CFA	Removed Prior to CFA	Removed Prior to CFA
Work Together	0.97	Removed Prior to CFA	Removed Prior to CFA
Shared Knowledge	Removed Prior to CFA	0.79	0.82
Mutual Respect	0.91	0.76	0.84
Shared Goals	0.85	0.75	0.67
Influence	0.86	0.93	0.71
Fit Indices	**Value**		
RMSEA	0.2	0.16	0
CFI	0.96	0.95	1
TLI	0.92	0.91	1.19
SRMR	0.03	0.06	0.05
P-value of LRT	0.19	0.26	0.69

III.3.9 CFA Influence Item for Care Coordinator Perspective on Least Benefitted Patient

The only iteration of the CFA for the care coordinator perspective of the least benefitted patient contained Timeliness, Work Together, Mutual Respect, Shared Goals and Influence. The loading factors, Cronbach alpha value, and fit indices with the exception of RMSEA exhibited acceptable values (CFI > 0.90, TLI > 0.90, SRMR < 0.08). Additionally, the high p-value ($p>0.05$) suggests there is no difference between the patterns observed in these data and the specified model for the final model of the care coordinator perspective on the least benefitted patient with the influence item.

III.3.10 CFA Influence Item for Care Coordinator Perspective on Typical Patient

The only iteration of the CFA for the care coordinator perspective of the typical patient contained Timeliness, Shared Knowledge, Mutual Respect, Shared Goals and Influence. The loading factors, Cronbach alpha value, and three of the four fit indices all exceeded the acceptable threshold values (CFI > 0.90, TLI > 0.90, SRMR < 0.08). Furthermore, the high p-value ($p>0.05$) suggests there is no difference between the patterns observed in these data and the specified model for the final model of the care coordinator perspective on the typical benefitted patient with the influence item.

III.3.11 CFA RC Scale + Influence Item for Care Coordinator Perspective on Most Benefitted Patient

The only iteration of the CFA for the care coordinator perspective of the most benefitted patient contained Timeliness, Shared Knowledge, Mutual Respect, Shared Goals and Influence. The loading factors, Cronbach alpha value, and fit indices all exceeded the acceptable threshold values (RMSEA < 0.06, CFI > 0.90, TLI > 0.90, and

SRMR < 0.08). In addition, the high p-value ($p>0.05$) suggests the patterns observed in these data do not deviate significantly from specified final model of the care coordinator perspective on the most benefitted patient with the influence item.

III.3.12 Patient Perspective

All of the analyses up to this point have focused on the care coordinator perspective of the patient. The subsequent analyses focus on the patient perspective of the care coordinators.

III.3.13 CFA Patient Perspective-Cohort 1

The RC instrument was administered to the 167 patients in Cohort 1 who reported receiving care navigation. The polychoric correlation matrix displayed in Table 8 indicates no perfect correlations or any other oddities that would prevent convergence of a model. Thus, the initial iteration of CFA consists of the following base RC items: Frequency, Timeliness, Accuracy, Work Together, Blame, Shared Goals, Shared Knowledge, and Mutual Respect.

Table 8: Polychoric Correlation Matrix for Patient Cohort 1

Item	Frequency	Timeliness	Accuracy	Blame	Work Together	Shared Knowledge	Mutual Respect	Shared Goals
Frequency	1.00							
Timeliness	0.77	1.00						
Accuracy	0.64	0.72	1.00					
Blame	0.08	0.28	0.19	1.00				
Work Together	0.56	0.68	0.64	0.14	1.00			
Shared Knowledge	0.64	0.61	0.58	0.13	0.59	1.00		
Mutual Respect	0.52	0.61	0.67	0.06	0.46	0.61	1.00	
Shared Goals	0.43	0.59	0.69	0.06	0.52	0.60	0.69	1.00

The results of the first iteration of CFA with the first cohort patient perspective of the care coordinators containing Frequency, Timeliness, Accuracy, Work Together, Blame, Shared Goals, Shared Knowledge, and Mutual Respect are shown on Table 9. The Cronbach alpha, seven of the eight loading factors and only one of the four fit indices exhibited acceptable values (CFI > 0.90). In addition, the Blame item did not load well onto the scale as its loading factor fell considerably below the minimum acceptable value of 0.4. It also registered an insignificant p-value of Likelihood Ratio Test (0.47). Consequently, it was removed for the subsequent iteration of CFA.

The second iteration indicated the remaining items loaded well onto the scale since all of the loading factors exceeded 0.4 and three of the fit indices showed acceptable values (CFI > 0.90, TLI > 0.90, and SRMR < 0.08). Even though the

RMSEA and p-value of Likelihood Ratio Test did not meet the acceptable thresholds, the excellent loading factors coupled with the high alpha were sufficient enough to establish this iteration as the final model. Thus, the final model contained the following items: Frequency, Timeliness, Accuracy, Work Together, Shared Knowledge, Mutual Respect and Shared Goals.

Table 9: CFA Patient Cohort 1 w) Blame Item (n=167)

Reliability Scale	**First Iteration Value**	**Second Iteration Value**
Cronbach Alpha	0.88	0.87
Item	**Loading Factor**	**Loading Factor**
Frequency	0.72	0.71
Timeliness	0.83	0.83
Accuracy	0.80	0.80
Work Together	0.68	0.68
Blame	0.34	Removed
Shared Knowledge	0.71	0.71
Mutual Respect	0.74	0.74
Shared Goals	0.76	0.76
Fit Measures	**Value**	**Value**
RMSEA	0.12	0.11
CFI	0.91	0.95
TLI	0.87	0.92
SRMR	0.09	0.04
P-value of LRT	0.00	0.0003

III.3.14 CFA Combined Patient Perspective-Cohort 1+2

After determining the blame item does not load well onto the RC scale in the previous analyses, a combined CFA from patient cohort 1 (n=167) and patient cohort 2 (n=159) was conducted for the remaining RC items of Frequency, Timeliness, Accuracy, Work Together, Shared Knowledge, Mutual Respect, and Shared Goals. The samples were combined to provide a more robust sample size needed to conduct CFA. Table 10 contains the results of the only CFA iteration. For the only iteration of CFA with the combined patient samples, the Cronbach alpha, three of the four fit indices (CFI > 0.90, TLI > 0.90, and SRMR < 0.08), and the factor loadings exhibited acceptable values. However, the p-value of Likelihood Ratio Test (0.001) was significant. The same trend existed in subsequent iterations in which neither the RMSEA nor the p-value of Likelihood Ratio Test yielded an acceptable value. Though all of the fit indices did not yield acceptable values for the first iteration model, it would reflect the final model for this context due to the lack of improvement in subsequent iterations coupled with the strong loading factors already present. Thus, the final model for this context of the combined patient sample contains the following items: Frequency, Timeliness, Accuracy, Work Together, Shared Knowledge, Mutual Respect, and Shared Goals.

Table 10: Combined Patient Sample CFA w/o Blame Item (n=326)

Reliability Scale	First Iteration Value
Cronbach Alpha	0.91
Item	Loading Factor
Frequency	0.81
Timeliness	0.86
Accuracy	0.84
Work Together	0.83
Shared Knowledge	0.79
Mutual Respect	0.84
Shared Goals	0.82
Fit Measures	Value
RMSEA	0.10
CFI	0.97
TLI	0.95
SRMR	0.03
P-value of LR Test	0.00

III.3.15 CFA Influence Item for Patient Perspective-Combined Cohort

Based on the final model of the combined cohort patient perspective of the care coordinators, further CFA analyses were conducted with the influence item. The purpose is to determine how well influence loads onto the final structure in this context of the combined cohort patient perspective of the care coordinators.

The results of the only iteration of the CFA for combined cohort patient perspective of the care coordinators containing Frequency, Timeliness, Accuracy, Work Together, Shared Knowledge, Mutual Respect, Shared Goals and Influence are shown

on Table 11. The loading factors, Cronbach alpha value, and three of the four fit indices met the acceptable threshold values (CFI > 0.90, TLI > 0.90 and SRMR < 0.08). The significant p-value of Likelihood Ratio Test ($p<0.05$) suggests the data is significantly different from the specified factor model.

Table 11: CFA for the Combined Cohort Patient Perspective of the Care Coordinators w) Influence Item (n=326)

Reliability Scale	First Iteration Value
Cronbach Alpha	0.92
Item	Loading Factor
Frequency	0.81
Timeliness	0.86
Accuracy	0.84
Work Together	0.82
Shared Knowledge	0.78
Mutual Respect	0.85
Shared Goals	0.84
Influence	0.68
Fit Measures	Value
RMSEA	0.10
CFI	0.96
TLI	0.95
SRMR	0.03
P-value of LRT	0.00

III.3.16 Sensitivity Analyses for RC Scale-English

Further sensitivity analyses using CFA were conducted in relation to the language in which the RC survey was administered (English versus Spanish) to test for

RC's factor invariance. Thus, the CFA was conducted separately for the surveys conducted in English (n=265) versus the surveys conducted in Spanish (n=52). Table 12 below exhibits the results for all the CFA iterations for the surveys conducted in English.

Table 12: CFA for Combined Patient Sample- English (n=265)

Reliability Scale	First Iteration Value
Cronbach Alpha	0.92
Item	Loading Factor
Frequency	0.82
Timeliness	0.87
Accuracy	0.83
Work Together	0.87
Shared Knowledge	0.81
Mutual Respect	0.85
Shared Goals	0.81
Fit Measures	Value
RMSEA	0.11
CFI	0.97
TLI	0.95
SRMR	0.03
P-value of LR Test	0

For the first iteration of CFA with the combined patient sample survey done in English, the Cronbach alpha, the loading factors, and three of the four fit indices exceeded the threshold for the acceptable values (TLI > 0.90, CFI > 0.90 and SRMR < 0.08). Further removal of items did not improve any of the fit indices nor did it lead to a

significant P-value of Likelihood Ratio Test. Thus, the final model for the patient combined sample survey done in English contains the following items: Frequency, Timeliness, Accuracy, Work Together, Shared Goals, Shared Knowledge and Mutual Respect.

III.3.17 Combined Sensitivity Analyses for RC Scale-Spanish

Table 13 below exhibits the results for all the CFA iterations for the surveys conducted in Spanish.

Table 13: CFA for Combined Patient Sample - Spanish (n=52)

Reliability Scale	First Iteration Value
Cronbach Alpha	0.90
Item	
Frequency	0.80
Timeliness	0.85
Accuracy	0.87
Work Together	0.59
Shared Knowledge	0.66
Mutual Respect	0.68
Shared Goals	0.83
Fit Measures	Value
RMSEA	0.16
CFI	0.91
TLI	0.87
SRMR	0.06
P-value of LR Test	0.004

For the first iteration of CFA with the combined patient sample survey done in Spanish, the Cronbach alpha, two of the four fit indices (CFI > 0.90 and SRMR < 0.08), and the factor loadings exhibited acceptable values. Even though the TLI and RMSEA values did not meet the requirements for acceptable fit, the overall high reliability (0.90) and strong loading factors exhibited by each of the items suggests no further iterations are needed. Thus, the final model for the combined patient sample survey done in Spanish contains the entire set of original RC items.

III.3.18 Comparison of Results for English and Spanish CFA

The final CFA models of both English and Spanish administered versions of the RC survey contained all of the original RC items.

III.3.19 Sensitivity Analyses for RC Scale-Education

Further CFA was conducted separately for the people who neither completed high school nor received a GED versus people with at least a GED to test for factor invariance. Table 14 below exhibits the results for the count data relating to education in this combined patient sample.

Table 14: Highest Education Level in Combined Patient Sample

Highest Education Level	Frequency	Total
Neither High School nor GED		107
GED	30	
High school diploma	82	
Some college /associate	81	
4 year college degree	23	
Refused to answer	2	
High school or higher		216
Total		325

III.3.20 CFA Combined Patient Sample w) High School Education or GED

Table 15 below shows the iterations of CFA for the combined patient sample individuals who at least completed high school or obtained a GED (n=216).

Table 15: Combined Patient Sample Individuals Who at Least Completed High School or Received GED (n=216)

Reliability Scale	First Iteration Value
Cronbach Alpha	0.92
Item	
Frequency	0.85
Timeliness	0.89
Accuracy	0.84
Work Together	0.87
Shared Knowledge	0.82
Mutual Respect	0.86
Shared Goals	0.83
Fit Measures	Value
RMSEA	0.13
CFI	0.95
TLI	0.93
SRMR	0.03
P-value of LR Test	0.00

For the first iteration of CFA combined patient sample who at least completed high school or obtained a GED, the Cronbach alpha, the factor loadings and three of the four fit indices exceeded the acceptable values (CFI > 0.90, TLI > 0.90, and SRMR < 0.08). Further removal of items did not improve any of the fit indices nor did it lead to a significant P-value of Likelihood Ratio Test. Thus, the final model for the combined patient sample individuals who at least completed high school or obtained a GED contains the following items: Frequency, Timeliness, Accuracy, Work Together, Shared Goals, Shared Knowledge and Mutual Respect.

III.3.21 CFA Combined patient sample w/o High School Education or GED

Table 16 below shows the iterations of CFA for the patient cohort 2 individuals who neither completed high school nor obtained a GED (n=107).

Table 16: CFA for Combined Patient Sample Individuals with Less than High School Education (n=107)

Reliability Scale	First Iteration Value
Cronbach Alpha	0.88
Item	
Frequency	0.70
Timeliness	0.79
Accuracy	0.83
Work Together	0.69
Shared Knowledge	0.71
Mutual Respect	0.75
Shared Goals	0.78
Fit Measures	Value
RMSEA	0.06
CFI	0.98
TLI	0.97
SRMR	0.04
P-value of LR Test	0.13

With the first iteration of CFA with the combined patient sample individuals who neither completed high school nor obtained a GED, all of the Cronbach alpha, factor

loadings, and three of the four fit indices (CFI > 0.90, TLI > 0.90, and SRMR < 0.08) exceeded acceptable thresholds. Furthermore, the high P-value of Likelihood Ratio Test (0.13) indicates there is no difference between the patterns observed in these data and the specified model for this first iteration. No further iterations were needed.

The final model for the patient cohort 2 individuals who neither completed high school nor obtained a GED contains the following items: Frequency, Timeliness, Accuracy, Work Together, Shared Knowledge, Mutual Respect, and Shared Goals.

III.3.22 Comparison of Results for Educational Level

The final model did not vary across educational levels (those who completed high school or received a GED versus those who did not complete high school and did not receive a GED). Both final models contained all of the original RC items.

III.3.23 Mean Response of Patients and Care Coordinators

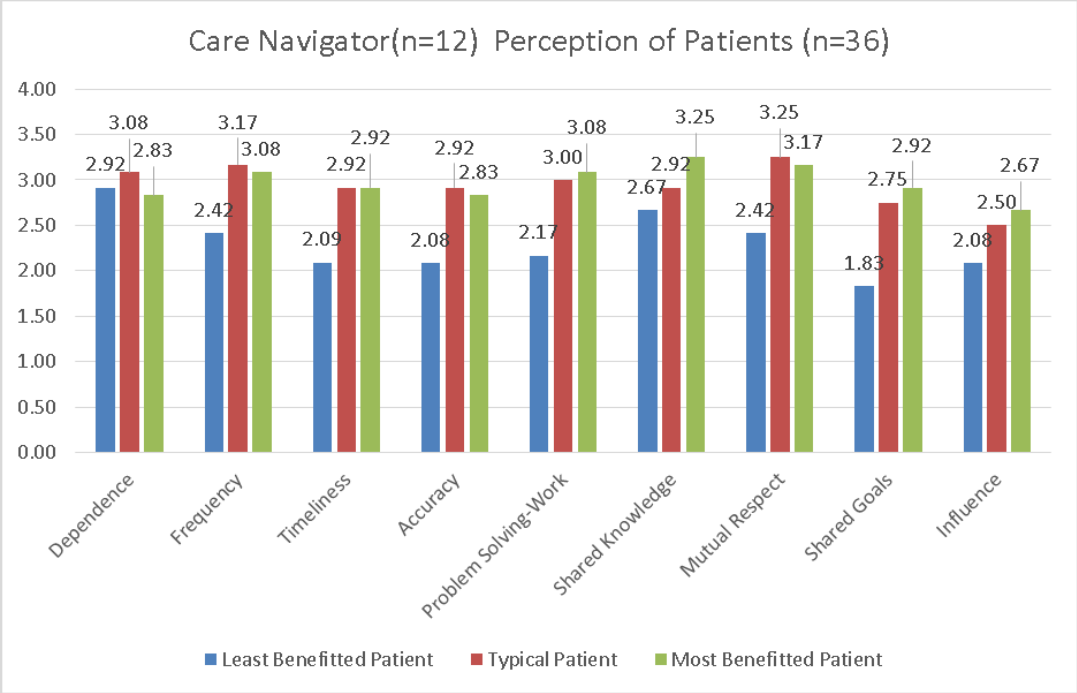
As mentioned in the methods section, there were two sets of analyses done for the comparison of means section : first set of analyses involved the comparison of the mean responses for the RC instrument (ranging from 0 to 4) administered to the care coordinators for each of the variables among the three different types of patients (most benefitted, typical, and least benefitted) and second set of analyses involved the comparison between the "typical" patient and the care coordinator mean responses.

The purpose of the first set of analyses involved determining whether there was a substantive difference between these three types of patients in perceived quality of coordination from the perspective of the care coordinator. The purpose of the second set

of analyses involved the comparison between the typical patient from the care coordinator perspective and the mean response from the patient perspective of all the individuals who reported receiving care navigation across both cohorts (n=326) in order to determine whether there was a substantive difference in the perception of the quality of care coordination between patients and care coordinators.

For the first set of analyses involving the care coordinator perception of three types of patients, Figure 2 illustrates the bar generated from the instrument data from the care coordinator perspective of the patients across the sites in which the instrument was administered. It shows the mean response of care coordinators for the three types of patients (most benefitted, typical, and least benefitted) for each of the items in the RC instrument. The results indicate a higher mean response for the most benefitted patient than the other two types of patients on only four of the nine items. However, the mean response did not exceed one unit of measurement (in the Likert like scale ranging from 0 to 4) between any of the three types of patients across eight of the nine items with shared goals being the exception. For the purposes of this study, as mentioned in the methods section, a difference of one unit on a five-point scale was deemed as a substantive difference since it is sufficient to cross between categories. In the shared goals item, the mean response between the most and least benefitted patient exceeded one point.

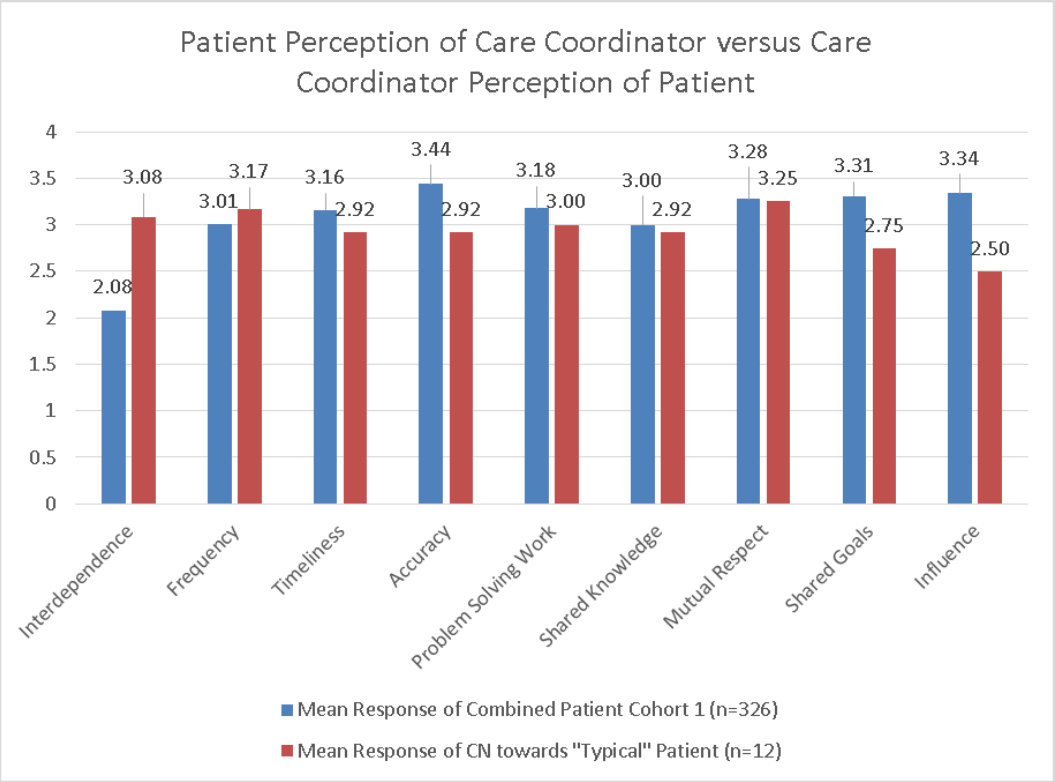
Figure 2: Care Coordinator (n=12) Perception of Patients (n=36)



The second set of comparisons involved first calculating the mean responses of the patient perspective of care coordinators across both cohorts for all of the RC items and comparing these responses to the average care coordinator response for their perception of the typical patient from the first set of analyses. Figure 3 illustrates the bar charts generated through the RC data from the patient perspective of the care coordinators from Cohort 2 as well as the care coordinator perspective of the patient. It shows the mean patient response for the care coordinators in each of the RC instrument questions across all of the sites the instrument was administered. It also shows the mean

response of care coordinators across the RC instrument items when asked about the typical patient.

Figure 3: Patient Perception of Care Coordinator versus Care Coordinator Perception of Patient



The results indicate mean response of patients being consistently higher than that of the care coordinator response towards the typical patient with the exception of the dependence (which is not part of the RC scale) and frequency items. In addition, the mean differences for all of the items failed to exceed one point on the five point Likert-like scale with the exception of Dependence.

III.4 Discussion

The original seven items of the RC scale exhibited strong reliability (Cronbach alpha values) across all fourteen sets of factor analyses in this section- three pertaining to the care coordinator perspective of the patients (least, typical, and most benefitted), two pertaining to the patient cohort perspectives of care coordinators (Cohort 1 with blame item and combined cohort without blame item), five pertaining to the influence item ran with the final model of the aforementioned five sets of factor analyses, and four pertaining to the sensitivity analyses relating to language and education (alpha > 0.80).

The initial CFA results with the full scale including the Blame item from patient cohort 1 perspective of the care coordinators showed the Blame item failed to load well on the scale as evident by its 0.05 loading factor falling well below the acceptable value of 0.40. The Blame item was reverse coded with the assumption that it would have a strong negative correlation with the Work Together item. However, that was not the case quite possibly because the care coordinators could blame one another yet work together to solve the problem. Thus, blaming and working together may not be mutually exclusive and would not necessarily represent different ends of the spectrum. Consequently, the Blame item was removed from further analysis.

Moreover, despite the strong alpha values, the hypothesized latent structure encompassing quality of coordination did not hold up fully in any of the care coordinator perception of patient contexts as no greater than four items exhibited acceptable fit on one given factor. This may have been precipitated by the small samples used for these analyses as all of the sample sizes for these analyses contained 10 observations- well

below the desired sample size of 200 (Statistics Solutions, 2013). These very small samples may explain the lack of convergence of the original RC items coupled with the problematic polychoric correlation matrix which indicated two sets of perfect correlations. However, there were some patterns of note: Timeliness, Mutual Respect, and Shared Goals appeared in the final model for all three types of patients while the final models for the typical and most benefitted patients contained identical items. The Mutual Respect and Shared Goals items reflect a common communication dimension within Relational Coordination. Thus, the results indicate care coordinators viewed quality of coordination across all three categories of patients as being shaped by the patient quickly giving them information when they need it, patient respecting the work the care coordinator does, and the patient possessing the same goals as them in managing their health.

However, the influence item loaded well on the final model in each of these care coordinator perspective contexts as indicated by the strong Cronbach alpha values, loading factors and fit indices as well as the high p-values. This means regardless of the category of the patient, having a say in what patients do to manage their health was important in measuring the quality of coordination in these contexts.

As for the patient perspective on the quality of care coordination, all seven items loaded well on the RC scale with combined patient sample. This indicates that all of the RC items were important in examining quality of coordination with care coordinators from the patient perspective.

Furthermore, the influence item loaded well with the RC items in this context. This implies from the patient perspective that having a say in what care coordinators do to manage their health fits in the common construct relating to quality of care coordination with all of the other RC items in this context of patient perception pertaining to quality of coordination with care coordinators.

As for the assessment of the RC for factor invariance based on language (English versus Spanish), all seven items were common to the final models of both English and Spanish. Frequency, Timeliness, Accuracy, and Work Together all reflect a common communication dimension within Relational Coordination while Shared Knowledge, Mutual Respect and Shared Goals represent a common relationship dimension within Relational Coordination (Gittell, 2011). Thus, both dimensions were well represented in the final model of both languages. Regardless of the language in which the RC instrument was administered, the patient perception as to the quality of coordination with their care coordinator was composed of receiving frequent, timely, and accurate information from the care coordinator as well as the perception of the care coordinator working with them to solve the problem. In addition, patient perception of the quality of coordination with the care coordinator comprised the care coordinator knowing what they are doing to manage their health coupled with having the same goals and respect for their activities in managing their own health. Overall, the consistency of the models as indicated by the strong Cronbach alpha and loading factors in both the English and Spanish CFA demonstrate a factor invariance of the RC scale when applied to the language of survey administration (English vs Spanish).

In addition, when examining factor invariance relating to the level of education (those with at least a GED compared to those without a GED/high school diploma), all seven items loaded well on the RC scale and were included in the final model. This indicates the factor invariance of the RC scale when applied to the factor of education since the Cronbach alphas, factor loadings for all of the items, and three of the four fit measures (CFI, TLI, and SRMR) exceeded acceptable values for both those with at least a GED and those without a GED/high school diploma.

Even when accounting for the factors of language and education, the results indicate strong consistency in the components patients in this combined cohort used to define quality of coordination with their care coordinators which included all of the RC items. Thus, the original items of RC scale not only proved robust amongst the combined patient sample in assessing quality of care coordination, but the RC scale exhibited strong factor invariance when applied to the factors of language and education level. Thus, when the RC items were applied to the combined patient sample, the strong factor loadings and fit indices indicate all of the items on the RC scale reflect a common construct.

Overall, this section indicates the hypothesized latent structure of the RC scale holds up better with patients than care coordinator perceptions across the three classes of patients. However, this finding could be attributable to the more robust sample sizes in the patient cohort samples (ranging from 52 as in the Spanish sample to 305 as in the combined patient cohort) as compared to the meager sizes (n=10) of each of the three classes of patients examined by the care coordinators. The problems associated with

such small sample sizes (as the ones capturing care coordinator perceptions) include sampling error bias which limits the representativeness of the data as well as "splintering" of factors which means they are placed into subgroups of items representing a larger factor (Lingard, 2006). This "splintering" of factors may explain why the final models of each of the patient groupings (least, typical, and most) all contained three items stemming from the original RC items.

As for the means comparisons between the patients and care coordinators, the responses for each of the RC items along with influence did not generate a difference that exceeded one point. The difference of one point in a 5 point Likert-like scale is sufficient to cross between categories (e.g. some of the time to most of the time). Thus, this indicates similar perceptions between the patients and the care coordinator rating of the typical patient with all of the RC items and influence. There were some other interesting patterns stemming from the means comparisons between the patients and care coordinators. For example, it was interesting to note that care coordinators reported a substantively higher degree of dependence on the patients than the patients reported for the care coordinators exceeding one point. This may stem from the fact that quality healthcare outcomes are generally dependent on patient adherence to the provider recommended treatment protocols (Martin et. al, 2005). Since this instrument is measuring quality of care coordination, it is understandable why the care coordinators report higher dependence on the patient in order to achieve quality outcomes since the care coordinators understand the process will likely not proceed in a desirable fashion without a sound commitment from the patient.

In addition, the mean response of the patients exceeded that of the care coordinator perception of the typical patient. across 6 of the 7 RC items. This is not necessarily a surprising finding considering that care coordinators may harbor more specific expectations from patients on how they need to manage their care than patients have of care coordinators in the process. This leads to higher perceptions from the coordination than patients who simply may be content with receiving some level of care not available to them before this program. Furthermore, many patients lack the appreciation for the importance of adhering to treatment protocols perhaps due to poor health literacy and understanding of the importance of their own role in managing their own healthcare.

Moreover, the care coordinators reported having less influence on patients than the patients reported for the influence on the care coordinator activities pertaining to the patient. This finding could be construed by the differential mindset of care coordinators in this care coordination process compared to the patients. Care coordinators are required to place paramount importance on patient preferences because care coordination likely would not function effectively without understanding the needs of the patient in order to better serve them and empower them to manage their conditions. As for patients, adherence to treatment protocols entails a steep learning curve especially for the patients who lack familiarity with the process of visiting the doctor and following up. In addition, the divide between a patient's actual health status and their own understanding of the reality surrounding their health status makes them less likely to fully adhere to clinical recommendations. In one recent McKinsey Health System study,

76 percent of the participants diagnosed with high-risk clinical conditions rated their health as excellent, very good, or good health (Sundiatu et al, 2012). When applied to this study, if patients even rate their health as "fair" despite the presence of a chronic illness, they might be less likely to allow a care coordinator to completely influence how they manage their health since they would not deem their health status as dire enough to warrant making such drastic changes to their lifestyle as suggested by the care coordinator. Thus, on one end with the patients, their behavior may be difficult to change and they may be less receptive than desired to incorporating the care coordinator guidelines while care coordinators are generally required to honor patient preferences even if those preferences operate in contravention to what the care coordinator feels would benefit the patients optimally. Consequently, patients are expected to report higher amounts of influence over care coordinator activities than care coordinators report about their influence on patient activities.

In summary, the RC scale exhibited strong external validity across a diverse group of patients which shows that it can be applied for patient-professional relationships. In addition, this section lends keen insight on the processes operating in the coordination between patients and care coordinators. This indicates that future attempts to improve care coordination should also focus on the needs of care coordinators along with the patients. Even though the differences in perception of quality of coordination between the patients and care coordinators were not considered significant in this study, they warrant further investigation as to the factors that

contribute to the relatively tepid perception of the care coordinators towards the quality of care coordination.

III.4.1 Limitations

The following assumptions accompany the use of confirmatory factor analysis: multivariate normality, sample size exceeding 200, and data coming from a random sample (Statistics Solutions, 2013). For the three patient samples from the perspective of the care coordinator, data were only collected about 30 patients falling well below the required sample size needed for this sample. The same applies for the sensitivity analyses when CFA was conducted with the individuals who completed the survey in Spanish and those individuals with less than a high school education (n=52). Overall, the sparse sample sizes in many of the analyses (care coordinator perception of patient samples, Spanish, less than high school education) may explain the poor fit indices specific to the RMSEA which gets inflated due to small sample sizes. In addition, this study involved patient self-selection which means the sample is not random. The issues of self-selection are also present in the patients who participated in the phone instrument versus those who did not participate. Those who participated may have participated because of their positive experiences versus those who did not participate. However, participation may also be fueled by negative experiences as well. Nonetheless, issues of self-selection may limit the generalizability of these results.

CHAPTER IV

CARE COORDINATOR AND COMMUNITY PARTNER RELATIONAL COORDINATION

IV.1 Introduction

ED overuse has contributed to roughly $38 billion of the approximately $700 billion of annual wasteful spending in American healthcare (New England Healthcare Institute, 2008). A more recent study based on insurance claims data determined that 71% of ED visits were unnecessary and avoidable which meant they could have been treated in a primary care setting or they did not require immediate attention (Truven Health Analytics,2013). This pattern of ED overuse is partially attributable to sparse access to primary care which pushes individuals to utilize the ED where they receive guaranteed care (National Priorities Partnership, 2010)

One study showed that of the people who utilize ED services, 63% of them reported visiting twice or more within a one year period while 8% of ED patients are considered "frequent flyers" defined as visiting the ED four or more times a year accounting for 28% of all ED visits (Hunt et al, 2006).

In order to ameliorate the dual issues of ED overuse and chronic illnesses, many programs and models have been proposed (e.g. disease management, case management, primary care medical homes, and the chronic care model). One recommendation provided by the New England Health Institute (NEHI) to address ED overuse involves forming collaborative relationships among the EDs, primary care physicians, and

community health services (NEHI, 2008). A specific application of the Chronic Care Model to address the needs of elderly people with complex medical conditions in the United Kingdom involved three components: integration with health and social services combining forces, altering location of care rendered with an emphasis on home- and community-based services, service delivery involving coordinators and pharmacists visiting people at home (Singh, 2008). The common thread across these recommendations and models entails the emphasis on coordination across agencies and organizations. The components of this model have been employed to address the healthcare gaps evident in other populations with complex needs in Texas.

In Texas alone, the cost of potentially preventable visits to EDs in 2012 was estimated at $1.2 billion (Texas Health and Human Services Commission, 2012). In order to address this problem, the Medicaid Waiver introduced care coordination programs which included the components of integration, home/community based care, and (in some instances) care coordinator visits to patient homes. Thus, the Waiver's use of healthcare coordination prompts the need to study the dynamics of coordination spanning across organizational boundaries.

The Relational Coordination instrument represents the instrument of choice in this study to examine how care coordinators collaborate with external agencies in rendering care for the frequent ED users. The Relational Coordination instrument is one of the main validated measures of coordination in health care that may be applied in situations where teams encompass disciplinary and organizational boundaries (Valentine et al., 2013). In a study of multi-disciplinary teams using the chronic care model,

Relational Coordination scores were positively associated with the quality of chronic care (Noel et al., 2013). In another chronic care setting, other measures of Relational Coordination were positively associated with community linkages, self-management support, decision support, delivery system design, and clinical information systems. Thus, the enhancement of Relational Coordination amongst core disease-management professionals with varying backgrounds improved chronic illness care delivery (Cramm et al., 2012). Relational Coordination between nurses and other care coordinators in a community hospital was related to reduced adverse events such as hospital-acquired infections and medication errors (Havens et al., 2010). In a study on the collaboration among eleven agencies encompassing various spheres (nutrition, social, medical, housing) in addressing the needs of people living with HIV, shared goals and mutual respect formed the strongest factors for coordination of care among agencies joining forces collaborating. (Khosla et al, 2016).

Thus, these studies collectively indicate the importance of Relational Coordination across professional boundaries in order to improve patient outcomes for patients across multiple settings. However, very few studies to date have directly applied Relational Coordination to inter-organizational dynamics (Warfield, 2014). Thus, care coordination related to frequent ED use represents a logical context to test the Relational Coordination scale's external validity to coordination crossing organizational boundaries.

IV.1.1 Background

Past studies indicated the efficacy of care coordination in curbing ED readmission rates in urban hospitals (Corbett et al., 2005) and spurring primary care use (Horwitz et al., 2005). Patient care coordinators facilitate transitions across care settings and may also provide ongoing coordination to ensure that patients' needs are met (Dy et al., 2013). This entails communication with external agencies in addition to partnering with patients to create and follow plans honoring their needs and preferences. Care coordination programs are premised on the expectation that better coordination will improve access to community-based health and human services and thus reduce ED use. Prior studies have found that case management alone can reduce both ED visits and costs of care (Shumway et al., 2008), as can interventions emphasizing alternative care locations (Kravitz et al., 1998; Pines et al., 2011) or providing poverty relief such as housing (Sadowski et al., 2009).

When teams span organizations, team members assume the additional role of boundary spanners, enabling cooperation between two or more groups of people separated by location, hierarchy, or function (Cross et. al, 2004). Boundary spanners achieve this cooperation by sharing information between divergent groups and tailoring this information to meet the specific needs of the respective groups. Within the framework of inter-organizational health care coordination s, boundary spanners have proven effective in serving as liaisons between organizations (Gittell & Weiss, 2004; Hansson, et al., 2010; Lemak et al., 2004). Thus, examining Relational Coordination

between boundary spanners may serve as a stepping stone in applying Relational Coordination to inter-organizational cooperation (Gittell, 2011).

IV.2 Methods

IV.2.1 Sample

The Relational Coordination instrument was administered to care coordinators in ten Waiver-funded patient care coordination projects. The care coordinators reported perceptions for a larger number of key partners and the analysis included their perceptions of the key partners that did not participate in the study. Thus, all of the care coordinator perceptions of key partners were used in the analysis even if there was no data obtained from the key partner. In three of the sites, there was more than one care coordinator which provided information about their key partners. When there were multiple care coordinators per site, their responses were averaged to obtain values for that project's quality of ties with each key partner. In one interview at each project site, a staff member was asked to identify up to five of the internal or external partners with which they worked most closely to meet patient needs. However, in a later Wave of interviewing (Wave 2), the limit was removed in order to allow the care coordinators to more completely identify their key partners. These could include, for instance, medical assistance programs, local churches, and food banks. In the first wave of data (2014-2015), 22 of the 46 community agencies these care coordinators had identified as key partners participated in the study. In the second wave (2015-2016), the instrument was administered to 19 of the 59 identified key partners. Table 17 below indicates the number and type of key partners.

Table 17: Categories of Key Partners and Services Provided

Category of Key Partner (n=22)	Type of Service
State Services	CPS, DPS (public safety), DHS, SNAP
Federal	Medicare, Medicaid
Community	Faith based and non-profit resources, shelter, Salvation Army
Health Care coordinators	Rural and other community health clinics, home health, hospital ER

Table 18 contains the original wording of the questions from the RC instrument and the modified wording of the RC instrument as administered to both the care coordinators and key partners. Some of the item wording of the instrument was altered to allow consistent response options using the Likert-like scale ranging from 0 to 4 in which 0=Never, 1= Rarely, 2=Some of the time, 3= Most of the time, 4= All of the time.

Table 18: Relational Coordination Instrument Administered to Care Coordinators and Key Partners

Variable	Original wording of the question from the Relational Coordination Instrument (Gittell, 2011)	Wording of the question as administered to both the care coordinator and key partner
Dependence	(not part of Relational Coordination scale) -Pertains to the extent the individual needed help from the other person. -Does not relate to quality of care coordination when the extent of dependence is low.	How often do you need anything (i.e., external resources) from (specified key partner) to serve patients in this care navigation program?
Frequency	How frequently do people in each of these groups communicate with you about (insert focal work process/client population)?	(if at least 'rarely' need the partner:) When you need something from them, how often do you get it?
Timeliness	Do they communicate with you in a timely way about (insert focal work process/client population)?	(if at least 'rarely' needs information from this partner:) How often does (specified key partner) give you what you need as quickly as you need it?
Accuracy	Do they communicate with you accurately about (insert focal work process/client population)?	(if at least 'rarely' needs information from this partner:) How often do you think the information (specified key partner) gives you is accurate?
Problem Solving	When there is a problem with (insert focal work process/client population), do people in each of these groups blame others or work with you to solve the problem?	Separate questions: When there is a problem, how often does (specified key partner) blame others? (reverse coded) When there is a problem (something has gone wrong), how often does (specified key partner) work with you to solve the problem?

Table 18 Continued		
Variable	**Original wording of the question from the Relational Coordination Instrument (Gittell,2011)**	**Wording of the question as administered to both the care coordinator and key partner.**
Shared Goals	Do people in each of these groups share your goals for (insert focal work process/client population)?	How often do they have the same goals as you do for taking care of patients?
Shared Knowledge	Do people in each of these groups know about the work you do with (insert focal work process/client population)?	How often do they know about the work you do?
Mutual Respect	Do people in each of these groups respect the work you do with (insert focal work process/client population)?	How often do they respect the work you do?
Influence	(Developed by Dana Weinberg; not part of original Relational Coordination scale)	Do you have a say in what they do with patients?

Note: The following indicate the response options for each item: 0=Never, 1= Rarely, 2=Some of the time, 3= Most of the time, 4= All of the time

IV.2.2 Analysis Plan

The first task involved confirmatory factor analysis with robust maximum likelihood estimation to test for the external validity of the RC instrument in this context. The second task entailed comparing the mean care coordinator and key partner responses across each of the variables in the instrument. The last task tested for change between the first and second waves of data with the number of key partners cited. The purpose of this analysis involves understanding the breadth of care coordination ties and how this may have changed when removing the key partner identification limitations.

IV.3 Results

Factor Analyses Cohort 1 Pooled Care Coordinators and Key Partner Sample

Before conducting any factor analyses, polychoric correlations were used to diagnose any items potentially preventing the model from converging. The polychoric correlations exhibited in Table 19 indicated Blame and Shared Knowledge as problematic items due to both items exhibiting negative correlations with at least four other items. Thus, both items were removed from any further analyses.

Table 19: Cohort 1 Polychoric Correlations for Care Coordinators and Key Partners

Variable	Frequency	Timeliness	Accuracy	Blame	Work Together	Shared Knowledge	Mutual Respect	Shared Goals
Frequency	1.00							
Timeliness	0.78	1.00						
Accuracy	0.69	0.60	1.00					
Blame	-0.05	0.46	-0.20	1.00				
Work Together	0.87	0.86	0.80	-0.06	1.00			
Shared Knowledge	-0.06	-0.06	0.21	-0.66	0.32	1.00		
Mutual Respect	-0.24	0.19	0.22	-0.44	0.33	0.83	1.00	
Shared Goals	0.18	0.43	0.77	0.41	0.36	-0.03	-0.06	1.00

Table 20 demonstrates the polychoric correlations run for the remaining six items to confirm there are no other problematic items. The correlations appear normal with an absence of perfect correlations and negative correlations. Thus, the first iteration of CFA

involved the following variables: Frequency, Timeliness, Accuracy, Work Together, Mutual Respect, and Shared Goals.

Table 20: Cohort 1 Polychoric Correlations for Care Coordinators and Key Partners w/o Shared Knowledge and Blame

Variable	Frequency	Timeliness	Accuracy	Work Together	Mutual Respect	Shared Goals
Frequency	1					
Timeliness	0.48	1				
Accuracy	0.84	0.56	1			
Work Together	0.06	0.28	0.41	1		
Mutual Respect	0.39	0.27	0.6	0.76	1	
Shared Goals	0.54	0.66	0.54	0.16	0.4	1

In order to obtain a robust sample size, the wave 1 and wave 2 data (both of which contain care coordinators and key partner responses) were combined for subsequent CFA using the following items: Frequency, Timeliness, Accuracy, Work Together, Mutual Respect, and Shared Goals. The results for both iterations of CFA with the combined care coordinators and key partner samples are displayed in Table 21. For the first iteration, all of the variables met the threshold for sufficient loading and the alpha Cronbach coefficient exceeded the minimum acceptable value. However, only two of the four fit indices exhibited acceptable values (CFI>0.90 and SRMR < 0.08).

Furthermore, the p-value was significant which means the patterns of the data differed significantly from the hypothesized latent structure. Thus, Mutual Respect was removed for the next iteration which became necessary after two the fit indices failed to meet the aforementioned fit thresholds. The next iteration involved the following items: Frequency, Timeliness, Accuracy, Work Together, and Shared Goals.

The results of the second iteration of CFA combined care coordinators and key partner sample consisting of Frequency, Timeliness, Accuracy, Work Together, and Shared Goals show that all of the variables met the threshold for sufficient loading. Only one of fit indices (RMSEA) failed to meet the fit thresholds. Furthermore, the p-value was not significant (>0.05) which means there is no difference between the patterns observed in these data and the specified model for this second iteration. Thus, this iteration contained the final model which involved the removal of Shared Knowledge and Mutual Respect.

Table 21: CFA for Combined Care Coordinators and Key Partner Sample (n=123)

Reliability Scale	**First Iteration Value**	**Second Iteration Value**
Cronbach Alpha	0.82	0.81
Item	**Loading Factor**	**Loading Factor**
Frequency	0.70	0.74
Timeliness	0.82	0.85
Accuracy	0.65	0.63
Work Together	0.86	0.84
Mutual Respect	0.56	Removed
Shared Goals	0.58	0.54
Fit Measures	**Value**	**Value**
RMSEA	0.13	0.08
CFI	0.93	0.98
TLI	0.87	0.96
SRMR	0.07	0.04
P-value of Likelihood Ratio Test	0.0014	0.09

IV.3.1 CFA RC Scale + Influence Item for Care Coordinators and Key Partners-Combined Sample

After obtaining the final model for the RC items for the combined pooled care coordinators and key partner sample, the next step was to test the hypothesis of influence (despite not being part of the original RC) being correlated with the remaining RC items by examining how well influence loads onto the final structure in this context of Cohort 1 pooled care coordinators and their key partners. Based on the final model of the combined pooled care coordinators and key partner sample, further CFA analyses were

conducted with the influence item. The purpose was to determine how well influence loads onto the final structure in this context of combined pooled care coordinators and key partner sample.

The results of the only iteration of the combined care coordinators and key partner sample containing Frequency, Timeliness, Accuracy, Work Together, Shared Goals and Influence are shown on Table 22. The Cronbach alpha value, loading factors (including the influence item itself) and three of the four fit indices (with RMSEA being the exception) met the criteria for minimum acceptable values.

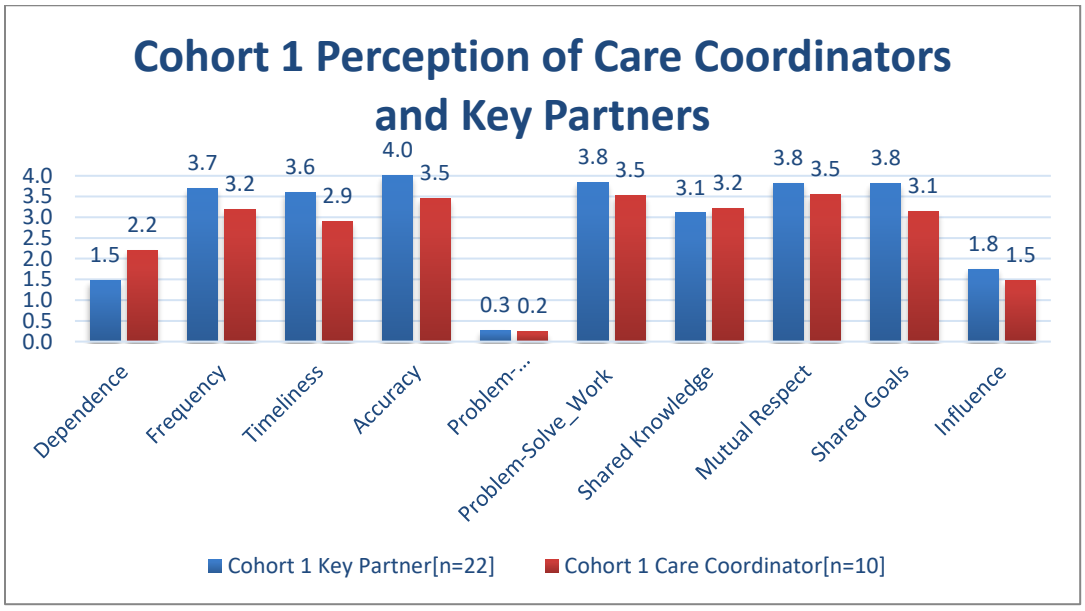
Table 22: CFA First Iteration of RC+ Influence Item for Care Coordinators and Key Partners Combined Sample (n=123)

Reliability Scale	**First Iteration Value**
Cronbach Alpha	0.80
Item	**Loading Factor**
Frequency	0.75
Timeliness	0.88
Accuracy	0.61
Work Together	0.79
Shared Goals	0.51
Influence	0.53
Fit Measures	**Value**
RMSEA	0.11
CFI	0.94
TLI	0.90
SRMR	0.07
P-value of Likelihood Ratio Test	0.006

IV.3.2 Means Comparisons

The mean response of care coordinators and their key partners for each of the RC questions was calculated across all sites in both waves of data in order to determine whether there was a substantive difference in the reciprocal perceptions of care coordination quality between the care coordinators and key partners and whether these patterns differed over time. Figure 4 below illustrates the bar charts generated from the instrument data capturing the reciprocal perception of both care coordinators and key partners in Cohort 1:

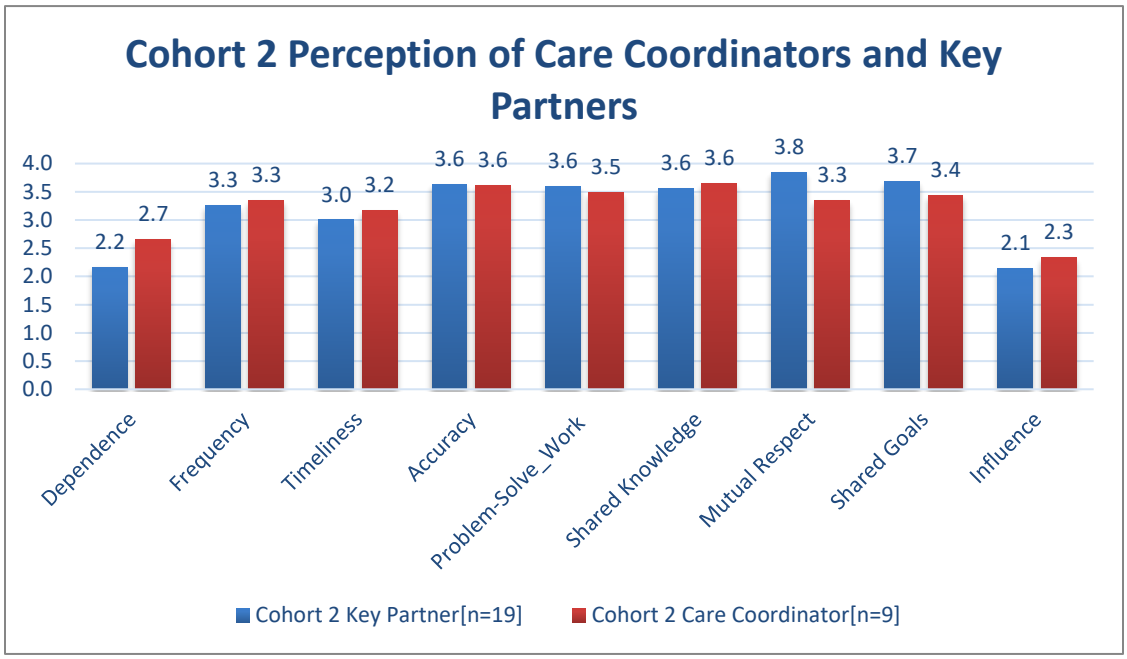
Figure 4: Cohort 1 Perception of Care Coordinators vs Key Partners



As indicated by the data in Figure 4, the care coordinator reported a higher mean dependence, but their mean responses to all of the quality of care coordination questions from RC were lower than that of the key partners. However, the mean difference in responses were below one unit (in a five point Likert-like scale in which a one unit difference is sufficient to cross between categories of responses) in all of the variables.

Figure 5 below illustrates the bar charts generated from the instrument data capturing the reciprocal perception of both care coordinators and key partners in Cohort 2:

Figure 5: Cohort 2 Perception of Care Coordinators and Key Partners



The trend in Cohort 2 is of dependence is similar to that of Cohort 1 in which the care coordinators reported a higher mean response. Moreover, unlike Cohort 1, the mean perceptions of the quality of care coordination for care coordinators are very similar to that of the key partners since three of the items exhibit identical means while the mean response of care coordinators for timeliness is higher.

Figure 6 below shows the changes in number of key partners from Cohort 1 to Cohort 2.

Figure 6: Change in Key Partners

Patient Cohort	***Number of Key Partners***
1	22
2	19

IV.4 Discussion

As indicated by the CFA conducted in the combined (wave 1+2) care coordinator and key partner sample, the hypothesized latent structure of the original seven RC items did not hold up. This is exhibited by the negative correlations and high p-values registered by both the Blame and Shared Knowledge items which precipitated removal of both for the main CFA involving the combined care coordinator and key partner sample.

However, the final model of the combined care coordinator and key partner sample contained five of the original seven RC items (Frequency, Timeliness, Accuracy, Work Together and Shared Goals). This final model also exhibited strong factor loadings and satisfactory values on three of the four fit indices with RMSEA being the exception. Furthermore, the final model contained the items of Frequency, Timeliness, Accuracy and Work Together- all four of which combine to represent the communication dimension of Relational Coordination. Thus, it is evident both parties perceived the quality of coordination with the other as consisting of providing information in a frequent, timely and accurate fashion as well as being able to amicably work through any patient-related issues that protruded during care coordination. Consistent with the aforementioned Khosla study, shared goals proved an important component in coordination between the care coordinators and their key partners (Khosla,2016).

Additionally, the influence item loaded fairly well in the final model of combined sample with 3 of the 4 fit indices exhibiting acceptable values. This seems to suggest a reasonably strong structural relationship between having a say in what the other party does in managing a patient and each party's perception of the quality of care coordination.

Furthermore, the mean responses of the care coordinators and key partners indicated a progression in the quality of reciprocal interaction between the two groups from Cohort 1 to Cohort 2. In Cohort 1, key partners exhibited higher mean perception for quality of coordination across each of the RC items. Those mean perceptions

became relatively congruent by Cohort 2 in which the care coordinators recorded even or higher means than key partners on 4 of the 7 items. This finding coupled with the fact that none of the mean differences for any of the quality of coordination items exceeded one point in either cohort denote a strong degree of congruence in the perceptions of care coordination quality between care coordinators and their key partners. The difference of one point in a 5 point Likert-like scale is sufficient to cross between categories (e.g. some of the time to most of the time). Additionally, these results stemming from reciprocal interactions between care coordinators and their key partners demonstrate strong inter-rater reliability in perceptions of quality of coordination.

Moreover, the very low mean responses (ranging from 1.5 to 2.7) from both the care coordinators and their key partners for the dependence item in both cohorts may explain why the RC items did not exhibit ideal fit. Since the dependence between the two groups is generally low (e.g. limited to referral basis in some cases), this study lends insight into the limitations of the RC scale in these situations. The RC scale was designed to measure quality of coordination across organizational boundaries in situations where the dependence is high. In addition, both the care coordinators and their key partners reported low mean responses (ranging from 1.5 to 2.3) in the influence item across both cohorts. This suggests that neither group perceives to have much of a say in what the other one does with their patients. This brings into scrutiny the strength of these ties between the two organizations within the framework of care coordination.

One of the conditions upon which relational forms of coordination achieve desired performance outcomes is reciprocal interdependence in which the actions of each

participant affect and are affected by the actions of others (Gittell & Weiss, 2004). A profound degree of relational coordination is required for participants to be able to mutually adjust their actions in response to each other's actions and outcomes (Gittell &Weiss, 2004). Since the care coordinators and their key partners report both low degrees interdependence and influence, it does not seem there is a high degree of relational coordination prompting a mutual adjustment between some of the care coordinators and their key partners within these sites.

Thus, this study evinces a novel application of RC across organizations and shows the limitations of the RC instrument in a situation where the perceived dependence is deemed to be low amongst these organizations. This study also provides insight on the improving quality of reciprocal ties encompassing care coordination within these sites. The strong degree of congruence in the reciprocal perceptions coupled with the improvement over time indicates the extent of coordination in these sites is clearly improving.

IV.4.1 Limitations

The following assumptions accompany the use of confirmatory factor analysis: multivariate normality, sample size exceeding 200, and data coming from a random sample (Statistics Solutions, 2013). The combined care coordinator and key partner sample fell well below 200 which meant the sample size in this study was not robust enough. Thus, invariance testing is not possible with this sample.

In addition, this study involved a self-selection from the key partners which is particularly problematic in this inter-agency study where the response rate of the

identified key partners was only 30% in the combined cohort. Another issue with self-selection concerns the potential bias care coordinators have towards the key partners that participated versus the ones that did not participate in the study. Thus, the key partners that participated may not serve as representative of the target population potentially rendering our study inconsistent with modern sampling theory.

CHAPTER V

MENTAL HEALTH AND COMMUNITY HEALTH RELATIONAL COORDINATION

V.1 Introduction

Serious mental illness(SMI) is defined as a mental, behavioral, or emotional disorder (not including substance use-related disorders) diagnosable currently or within the past year resulting in serious functional impairment severely limiting one or more essential life activities (Center for Behavioral Health Statistics and Quality, 2015). In 2014, SMI included an estimated 9.8 million adults aged 18 or older in the United States representing 4.2% of all U.S. adults (Center for Behavioral Health Statistics and Quality, 2015). A similar prevalence of SMI is present in Texas where 5% of the state has been diagnosed with severe and persistent mental illness (NAMI, 2010). Adults with SMI die on average an estimated 25 years earlier than the general population (Parks J et al., 2006). Despite their profound physical health needs, the SMI population experiences greater difficulty in procuring primary and medical care than the general population (Miller et al, 2003, Bradford et al 2008, and Sokal et al, 2004). Consequently, they resort to disproportionately frequent use of the ED (Hackman et al, 2006).

The fragmentation of physical and mental health services generally results in inappropriate, disjointed care and redundant care eventually fueling an increase in health care costs (Nardone et. al, 2014). One study on long term Medicaid patients suffering from chronic conditions determined that fragmented care was associated with a 25

percent increase in medical costs and 16 percent more visits to the emergency department(ED) over a three-year period (Bouchard, 2013). Furthermore, around half of the patients in this study suffered from a behavioral health disorder which impacted the medical costs at the rate similar to possessing three chronic medical conditions. This finding was attributed primarily to the disconnect between primary care and behavioral healthcare providers leading to duplication of services and little to no communication pertaining to treatment plans.

Patient level, provider, and systemic issues compromise the ability of SMI individuals to access necessary care. The patient level factors preventing SMI individuals from maintaining good physical health include cognitive impairment, social isolation, lack of motivation, and socio-economic factors (Lawrence, 2010). Provider issues include the tendency of some practitioners to view individuals with SMI as difficult while attributing their abnormal behavior as an individual phenomenon rather than a psychosomatic illness (Lawrence, 2010). Systemic issues include the lack of clarity pertaining to the responsibility for the physical health of SMI patients, lack of integration between medicine and psychiatry, and geographic, managerial, and resource separation of physical and mental health settings (Druss, 2007).

In order to address these patient-level, provider, and systemic issues, various integration models have been proposed which include co-location of services, appointing case managers serving as liaisons between primary and mental care providers to coordinate the overall care for the patient, and shared care with primary care physicians. These models have been associated with increased access to basic health services,

curbing of stigma and greater potential for long-term continuity of care (Lawrence,2010).

Bridging primary and behavioral health services enable primary care providers to deal with the unique concerns of SMI individuals more effectually (Collins, 2010). In a study of SMI veterans in a VA primary care clinic co-located in the mental health setting, integration was associated with increased primary care use and greater achievement of specified cardiovascular risk goals among these veterans (Pirraglia et. al, 2012). In another co-located study dealing with SMI patients spearheaded by CalMEND Pilot Collaborative to Integrate Primary Care and Mental Health Services (CPCI) program, primary and mental health professionals worked together to improve patient treatment adherence and patient outcomes (Nover,2014). One study examining integration from the perspective of the primary care physicians ascertained that primary care physicians generally believed that the integrated care (as compared to referrals) led to better communication between primary care clinicians and mental health specialists and improved coordination of mental and physical care as well as improved communication between specialists in mental health and primary care (Gallo et al, 2004). All of these studies in various settings indicate that integration of primary and mental health services for individuals with SMI has ameliorated the aforementioned patient-level, provider, and systemic barriers preventing SMI individuals from attaining appropriate care.

Integration of primary and mental health services requires coordination between different types of professionals which include the primary care physicians (PCP),

registered nurses (RN), licensed practical nurses (LPN) and the behavioral health clinicians. The nature of coordination between these two sets of involves interpersonal strategies as well as PCPs and behavioral health clinicians working in unison to fulfill a specific patient goal even, though the care is rendered separately. (Cohen et al, 2015). The advantages to co-located sites include earlier identification of illness, greater acceptance of referrals, improved communication and greater care coordination (Collins et al, 2010).

Service integration requires interpersonal coordination which is addressed in Gittell's theory of Relational Coordination. Gittell asserts that effective coordination is achieved through communication that is frequent, timely, and accurate, as well as involving shared goals, shared knowledge, and mutual respect (Gittell, 2005). Shared goals ensure aligned interests; shared knowledge allows participants to understand how their specific tasks fit within the overall process; and mutual respect enables participants to overcome status barriers that might otherwise prevent them from taking others' perspectives into account (Gittell, 2011). Relational Coordination applies to the relationship between PCPs and behavioral health clinicians since interpersonal interactions require effective and timely communication between the parties along with shared goals pertaining to the patient.

Thus, the purpose of this study entailed applying the Relational Coordination instrument to an inter-professional coordination between PCPs and behavioral health clinicians in an integrated setting pertaining to SMI patients which consisted of a Texas-

wide sample of community mental health centers which integrated primary care through DSRIP (Wells, 2015).

V.1.1 Background

In the current context of the Waiver, the co-located sites possess one of the following arrangements: mental health organization hiring the primary care provider as a member of staff, mental care organization partners with a Federally Qualified Health Center (FQHC) which provides primary care services, or mental health organization partners with a non-FQHC primary care provider. However, the dynamics leading to greater care coordination within these settings have not been extensively studied nor has it been fully established that the primary and mental health professionals collaborate in a manner that leads to better patient outcomes. As mentioned in the previous paragraph, effective coordination is achieved through frequent, timely, and accurate communication as well as shared goals, shared knowledge, and mutual respect. However, with separate systems and the maintenance of unique professional cultures, the extent to which the primary and mental health professionals engage in accurate communication, shared goals, shared knowledge, and mutual respect is uncertain. Thus, the RC instrument serves to clarify the extent to which these components of effective care coordination are fulfilled in these co-location arrangements between the primary and mental health professionals.

The Relational Coordination instrument has been utilized in other inter-professional work environments including arrangements involving integration. In a Veterans Affairs (VA) study involving PCPs and behavioral care providers, the barriers

of successful integration included ineffectual communication processes, absence of shared goals and knowledge, and lack of mutual respect (Chang et al, 2014).

The RC instrument was applied to an integrated setting involving the care of elderly patients in examining how the nurses and medical specialists both collaborated with different types of professionals including physical/speech therapists, dieticians, and social workers (Hartgerink, 2014). Relational Coordination was much higher for nurses in their perceptions of coordination with other professionals compared to medical specialists' perceptions of coordination with other professionals. In one study, nurses evaluated their inter-professional coordination with various professional groups such as nursing colleague and managers, home doctors, care managers, home care workers, visiting therapists, day service and day care professionals, visiting bath professionals, and short stay professionals (Sakai et al, 2016). Nurses reporting higher levels of relational coordination with other professionals were more likely to reach client nursing care goals.

Thus, the proposed study represents a logical extension of the RC instrument to a relevant inter-professional context involving the integration of primary care and mental health services to address the needs of SMI individuals specifically. However, this study will go beyond the other studies in terms of determining the validity of the RC instrument in this integrated, inter-professional setting coupled with comparing the perceptions of both groups of professionals towards each other.

V.2 Methods

V.2.1 Sample

Originally there were ten sites involved in this study; however, two of the sites self-reported as non-operational at the time of the study since integration between the primary and mental health care professionals had not occurred. Given this development, the RC instrument was administered to a total of eight primary care professionals and eight mental health professionals across eight DSRIP funded sites in the Texas Waiver.

Table 23 contains the questions from the RC instrument administered to both the primary care professional and the mental health professional in each site. In consultation with Gittell, some of the item wording of the instrument was altered to allow consistent response options using the Likert-like scale. The coding for the responses on the Likert scale involved the following convention: 0=Never, 1= Rarely, 2=Some of the time, 3= Most of the time, 4= All of the time.

Table 23: Relational Coordination Instrument Wording Primary Care/Mental Health Professionals

Variable	Original wording of the question (Gittell,2011)	Wording of the question given to both primary care and mental health professionals in the study
Dependence	(not part of Relational Coordination scale) -Pertains to the extent the individual needed help from the other person. -Does not relate to quality of care coordination when the extent of dependence is low.	How **often** do you need information from [PC/behavioral health care provider] to serve patients in this care integration project?
Frequency	How frequently do people in each of these groups communicate with you about (insert focal work process/client population)?	[if at least 'rarely':] When you need information from them, how **often** do you get it?
Timeliness	Do they communicate with you in a timely way about (insert focal work process/client population)?	[if at least 'rarely' needs anything from this partner:] How often does [PC/behavioral health care provider] give you information as **quickly** as you need it?
Accuracy	Do they communicate with you accurately about (insert focal work process/client population)?	[if at least 'rarely' needs **information** from this partner:] How often do you think the information [PC/behavioral health care provider] gives you is **accurate**?
Work Together	When there is a problem with (insert focal work process/client population), do people in each of these groups blame others or work with you to solve the problem?	When there is a problem, how often does [PC/behavioral health care provider] work with you to **solve the problem**?
Shared Goals	Do people in each of these groups share your goals for (insert focal work process/client population)?	How often do they have the **same goals as you** do for taking care of patients?

Table 23 Continued		
Variable	**Original wording of the question (Gittell,2011)**	**Wording of the question given to both primary care and mental health professionals in the study**
Shared Knowledge	Do people in each of these groups know about the work you do with (insert focal work process/client population)?	How often do they **know** about the work you do?
Mutual Respect	Do people in each of these groups respect the work you do with (insert focal work process/client population)?	How often do they **respect** the work you do?
Influence	(Developed by Dana Weinberg; not part of original Relational Coordination scale)	How often do you have a **say** in what they do with patients?

Note: The following indicate the response options for each item: 0=Never, 1= Rarely, 2=Some of the time, 3= Most of the time, 4= All of the time

V.2.2 Analysis Plan

The statistical methods used in the study included confirmatory factor analyses and comparison of means from both the primary care and mental health professional responses. The former method tests for the external validity of the RC instrument in this context while the latter method examines the extent to which the primary care professionals and mental health professionals' perceptions match.

V.3 Results

The first part of the results section exhibited the outcomes of the confirmatory factor analysis for the primary care and mental health professionals separately. This includes the polychoric correlations, alpha coefficients, fit indices, and loading factors

for each variable. The next part involved showing the mean responses of the primary care and mental health professionals in each of the remaining RC items.

V.3.1 Confirmatory Factor Analyses Primary Care Professionals Perspective of Coordination with Mental Health Providers

Before conducting any factor analyses, polychoric correlations were used to diagnose items that could prevent model convergence. The initial polychoric correlation is shown on Table 24 below.

Table 24: Polychoric Correlation for Primary Care Professionals

Variable	Frequency	Timeliness	Accuracy	Work Together	Shared Knowledge	Mutual Respect	Shared Goals
Frequency	1.00						
Timeliness	0.62	1.00					
Accuracy	.	1.00	1.00				
Work Together	.	.	1.00	1.00			
Shared Knowledge	0.47	0.70	1.00	0.32	1.00		
Mutual Respect	-0.18	0.04	0.30	1.00	0.37	1.00	
Shared Goals	0.22	-0.45	-0.51	0.31	-0.86	-0.07	1.00

This polychoric correlation indicates three problematic items: Work Together (due to its two missing values), Mutual Respect (due to its two negative correlations), and Shared Goals (due to its four negative correlations). Though timeliness and accuracy exhibited a perfect correlation, the preponderance of missing and negative correlations presented bigger problems. Thus, in order to confirm that accuracy and

timeliness did not have a perfect correlation after the removal of the three items, another polychoric correlation was estimated with the remaining four items. Table 25 displays the results of the second round of polychoric correlations.

Table 25: Second Polychoric Correlation for Primary Care Professionals

Variable	Frequency	Timeliness	Accuracy	Shared Knowledge
Frequency	1.00			
Timeliness	0.63	1.00		
Accuracy	0.71	0.99	1.00	
Shared Knowledge	0.41	0.22	0.41	1.00

This new polychoric correlation matrix demonstrates no perfect correlation between timeliness and accuracy nor are there any other perfect correlations, negative correlations, or missing correlations.

Table 26 displays the results of both iterations of CFA. The first iteration of CFA includes the following four items from the original set of seven RC items: Frequency, Timeliness, Accuracy, and Shared Knowledge. The results indicate three of the four items loaded well on the construct with Shared Knowledge being the lone exception exhibiting a loading factor less than the desired 0.4. Thus, it was removed for the second CFA iteration even though all the fit indices met the desired thresholds.

The second CFA iteration contained the following three items from the original set of seven RC items: Frequency, Timeliness, and Accuracy. All of the loading factors

exceeded 0.4 while all of the fit indices exhibited perfect values. Thus, no further iterations were necessary and the final model for primary care professionals comprised of the following items: Frequency, Timeliness, and Accuracy.

Table 26: First Iteration of CFA for Primary Care Professionals Perspective of Coordination with Mental Health Providers

Reliability Scale	**First Iteration Value**	**Second Iteration Value**
Cronbach Alpha	0.69	0.79
Item	**Loading Factor**	
Frequency	0.55	0.55
Timeliness	0.85	0.88
Accuracy	0.94	0.91
Shared Knowledge	0.29	Removed
Fit Measures	**Value**	
RMSEA	0.00	0.00
CFI	1.00	1.00
TLI	1.84	1.00
SRMR	0.04	0.00
P-value of Likelihood Ratio Test	0.82	0.00

V.3.2 CFA RC Scale + Influence Item for Primary Care Professional Perspective of Coordination with Mental Health Providers

Based on the final model of the mental health professional perspective of the primary care professionals, further CFA analyses were conducted with the influence item. The purpose is to determine how well influence loads onto the final structure in this context of the primary care professional perspective of the mental health professionals.

The results of the only iteration of the CFA for mental health professional perspective of the mental health professionals containing Frequency, Timeliness, Accuracy and Influence are shown on Table 27. The model failed to converge, thus, no loading factors or fit indices could be estimated. The Cronbach alpha fell below 0.80. Since no loading factors or fit indices could be estimated, the influence item does not fit with the hypothesized latent structure of Relational Coordination.

Table 27: CFA First Iteration of RC+ Influence Item for Primary Care Professionals Perspective of Coordination with Mental Health Providers

Reliability Scale	***Value***
Cronbach Alpha	0.69

V.3.3 Confirmatory Factor Analyses Mental Healthcare Professionals

Before delving into the factor analyses, polychoric correlations were generated to identify items that could prevent convergence of a factor analysis model. The initial polychoric correlation is shown on Table 28 below.

Table 28: Polychoric Correlation for Mental Healthcare Professionals

Variable	Frequency	Timeliness	Accuracy	Work Together	Shared Knowledge	Mutual Respect	Shared Goals
Frequency	1.00						
Timeliness	0.30	1.00					
Accuracy	-0.01	1.00	1.00				
Work Together	0.37	0.29	0.32	1.00			
Shared Knowledge	0.13	1.00	.	0.47	1.00		
Mutual Respect	-0.01	0.46	0.48	.	.	1.00	
Shared Goals	-0.21	0.68	0.63	0.64	.	1.00	1.00

As indicated by the polychoric correlation matrix, the three problematic items included frequency (due to its three negative correlations), shared knowledge (three missing values), and mutual respect (with one negative correlation, two missing values, and a perfect correlation with shared goals). Thus, all three of these items were excluded from any further analysis. The first iteration of CFA included the following items: Timeliness, Accuracy, Work Together, and Shared Goals. Table 29 displays the results of the CFA for the first iteration.

Table 29: First Iteration of CFA for Mental Healthcare Professionals Perception of Primary Care Providers

Reliability Scale	**First Iteration Value**	**Second Iteration Value**
Cronbach Alpha	0.78	0.79
Item	**Loading Factor**	
Timeliness	0.96	1.00
Accuracy	0.83	0.82
Work Together	0.35	Removed
Shared Goals	0.54	0.57
Fit Measures	**Value**	
RMSEA	0.00	0.00
CFI	1.00	1.00
TLI	1.19	1.00
SRMR	0.10	0.00
P-value of Likelihood Ratio Test	0.73	0.00

All of the items with the exception of Work Together loaded well on the construct while three of the four fit indices (SRMR being the exception) registered desirable values consistent with the acceptable thresholds. However, in order to improve the model and its fit, the next iteration of CFA proceeded sans the Work Together item. Thus, the second iteration consisted of the following items: Timeliness, Accuracy, and Shared Goals.

All of the loading factors exceeded 0.4 while all of the fit indices exhibited perfect values. Thus, no further iterations were necessary and the final model for mental healthcare professionals composed of the following items: Timeliness, Accuracy, and Shared Goals.

V.3.4 CFA RC Scale + Influence Item for Mental Healthcare Professional Perspective of Primary Care Providers

Based on the final model of the mental health professional perspective of the primary care professionals, further CFA analyses were conducted with the influence item. The purpose is to determine how well influence loads onto the final structure in this context of the mental health professional perspective of the primary care professionals.

The results of the only iteration of the CFA for mental health professional perspective of the primary care professionals containing Timeliness, Accuracy, Shared Goals and Influence are shown on Table 30. The model failed to converge, thus, no loading factors nor fit indices could be estimated. Even though the Cronbach alpha met the acceptable threshold of 0.80, since no loading factors or fit indices could be estimated, the influence item does not fit with the hypothesized latent structure of Relational Coordination.

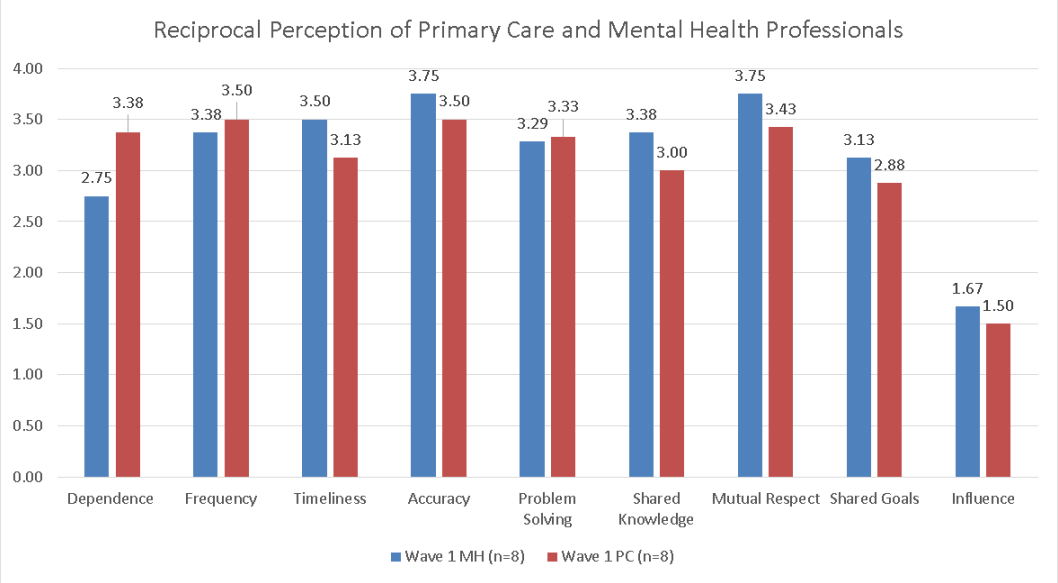
Table 30: CFA for MH Perspective of PCP+ Influence Item in Quality of Care Coordination

Reliability Scale	Value
Cronbach Alpha	0.88

V.3.5 Means Comparisons

Figure 7 shows bar charts generated from the instrument data capturing the reciprocal perception of quality of interactions for both primary care and mental health professionals.

Figure 7: Reciprocal Perception of Primary Care and Mental Health Professionals



As indicated by Figure 7, the dependence reported by the primary care professionals is higher than the mental healthcare professionals. However, their perceptions on the quality of care fluctuate as the means are higher for the primary care professionals in two of the measures (Frequency and Work Together) while the mental

healthcare professionals reported higher means on the other five. Moreover, none of the mean differences for any of the variables exceed one point.

V.4 Discussion

In both the primary care professional and mental health professional samples, the hypothesized latent structure of RC failed to converge initially, but once the problematic items were removed, both sets of factor analyses contained 3 items in the final model- both of which contained the Accuracy and Timeliness items. Furthermore, Accuracy and Timeliness both reflect a common communication dimension within Relational Coordination. Considering both groups contain highly skilled medical professionals, it is not surprising both groups' perception of the quality of coordination composed (in part) of the other group providing information quickly and accurately. This finding seems to line up with the existing literature on communication between mental health and primary care providers. In a recent study, mental health professionals reported a need to better understand the information requested by primary care professionals while the primary care professionals reported failure in receiving timely information from mental health providers as a barrier to collaboration (Greene et al, 2016). Consistent with the Greene et al study, Timeliness showed up in the final model for the primary care professional perception of the quality of care coordination with mental health professionals. This indicates that the primary care professionals gauge their quality of care coordination with mental health professionals in part through how quickly they receive information from the mental health professionals.

Moreover, the lack of convergence between the influence item and the final models of both sets of professionals indicates the influence item does not fit within the structure of RC.

Additionally, the high means reported by both groups of professionals across all seven RC items (mean ranging from 2.88 to 3.88) indicates a strong reciprocal perception of quality of coordination. In addition, none of the differences in mean perception across the RC items exceeded one point which denotes a reasonably high degree of inter-rater reliability in the perception of the interactions pertaining to care coordination. Thus, these results suggest both the primary care professional and mental health professionals perceived they were able to break through professional boundaries in order to ameliorate the situation for their SMI patients.

The mean perception of dependence reported by both groups reached relatively high levels (2.75 out of 4 for mental health professionals vs 3.38 out of 4 for primary care professionals). The higher perceived dependence on the part of the primary care professional is understandable especially considering the needs of the SMI patient align more with the skillset of a behavioral healthcare provider.

As for the influence item, the mean responses were relatively low (1.67 for mental health professionals vs 1.50 for primary care professionals). Even though they may acknowledge the need for one another to abet in their patient's care, neither group perceives they have much say in what the other will do with their patient. This may stem from the idea that both groups of professionals understand their professional

boundaries and respect the competence of the other group within their respective domain.

Overall, this study attempted to apply RC to an inter-professional context which ultimately did not line up with the hypothesized latent structure encompassing quality of coordination. However, these results indicate strong congruence in the perception of care coordination quality, but the lack of say reported by both groups elicits scrutiny as to the quality of coordination occurring in this context. It is possible both sets of professionals may possess congenial relationships and respect the competencies of the other group. However, the two groups may still be sequestered and deferential in how they deal with their patients. If the task relates to something in which one group of professionals possess strong perceived competence, they are not likely to share their plans with the other professional and vice versa. Moreover, if the task relates to something in which one group of professionals feels the other one's competence is higher, they will pass the patient onto the other professional to deal with the issue. Their communication may be entirely limited to situations where one of the professionals is simply not equipped to deal with and consequently summons the assistance of the other. The communication could potentially be ad-hoc based rather than truly periodic which affects the extent to which relational coordination can be applied.

V.4.1 Limitations

The following assumptions accompany the use of confirmatory factor analysis: multivariate normality in data, sample size exceeding 200, and data coming from a

random sample (Statistics Solutions, 2013). For the combined professional sample, fewer than 20 individuals participated which means the sample size is very sparse for the purposes of CFA.

CHAPTER VI

CONCLUSION

The main significance of these studies involves their novel application of the RC instrument to both patient-professional and inter-organizational relationships. The RC instrument has traditionally been applied to inter-unit or inter-professional relationships, but it has not been applied in the specific contexts covered in the previous chapters which include patient-care coordinator, care coordinators and their key partners (inter-agency) and across professionals (primary care and mental health professionals) in an integrated setting. These studies are some of the first to venture across organizational and professional boundaries. The RC items loaded well on a common construct when pertaining to the patient perception of the quality of coordination with the care coordinator, but did not load as strongly with care coordinators (when assessing their quality of coordination with patients). In addition, the original RC scale did not load well with primary and mental healthcare professionals when examining the quality of care coordination with each other perhaps due to the lower sample size associated with these groups.

These studies will collectively inform practice improving coordination between diverse groups. The current initiatives in healthcare are pushing towards patient centered care, teamlet models, integration between medical and mental care in the form of Assertive Community Treatment Team (ACTT), medical homes, and Accountable Care Organizations (ACO). A recent study concerning the ACO leaders awareness of

the RC dimensions showed these leaders felt four dimensions of RC were of particular importance in patient care management: frequency, timeliness, work together and shared goals (Rundall et al,2016). The ACO leaders reported frequency as crucial in improvement in information sharing, ongoing modification of patient care plans and performance standard development across ACO workgroups (inter-agency) while Work Together allows for leveraging partner organizational resources relating to outreach capability and databases. Additionally, these ACO leaders felt shared goals was instrumental in fostering positive relationships among the hospital, physician, and payer partners which in turn facilitated patient care coordination. Consistent with Rundall et. al, the results of the inter-agency study also indicted that frequency, timeliness, and Work Together all represented components in assessing the quality of coordination for both care coordinators and their key partners. In addition, all of these items composed the patient perception for the quality of coordination with the care coordinator.

The RC instrument being applied in these three studies lends insight on the dynamics of cooperation transcending patients and providers, organizational and professional boundaries. In turn, leveraging these relationships will lead to improved outcomes for patients.

VI.1 Limitations and Future Study

Each of the three studies contains an issue related to the sparse sample size (<200) for the purposes of confirmatory factor analysis. This was especially the case with the care coordinator samples in Chapter III and both the primary care and mental

health professionals in Chapter V. Another limitation involves self-selection in each of the studies which limits generalizability of the results.

Potential future research stemming from this study includes validating the results in similar settings perhaps in other areas across Texas or general healthcare settings involving coordination between different organizations or professionals. For example, since there was factor invariance related to language, it would be useful to replicate these same invariance analyses in similar settings where Spanish administrations of the survey are expected to be common. This would allow for a more robust assessment of factor invariance than in the current study where the number of people taking the Spanish version of the test was very small. In fact, the English version of the survey exceeded that of those taking the Spanish version of the survey by a factor of five. Furthermore, since there was factor invariance related to education level, RC can be administered in future studies regardless of the level of education the patient has received.

In addition, future research pertaining to factor invariance can be gauged with other variables such as race (e.g. whether the instrument yields similar results with African Americans compared to other races), gender, and insurance status (e.g. whether the instrument yields similar results with those who have no insurance or public insurance such as Medicaid versus those who receive private insurance either through the military or commercially). Testing invariance for these factors can further validate the RC instrument.

Furthermore, it would be useful examining the macro/micro interactions in both the inter-agency and inter-professional relationships that require multilevel analyses

which are not provided in this paper. These interactions affect the extent to which the groups are truly interdependent. Another future study direction stemming from these studies involves the potential for power and status differences and how it affects the extent to which the dependence is reciprocal.

Greater coordination of care will not only curb waste and improve efficiency within the healthcare system, but it will generate a sense of coherence for the vulnerable patients who find it difficult to navigate around the labyrinth characterizing the current reality of a fragmented healthcare system. Coordination may effectively dissuade patients from utilizing the ED when primary care options are available. In addition, when applied to SMI patients, coordination may allow SMI people to receive both physical and mental health services in the same location without being subject to stigmatization and confusion. These three studies shed light on how coordination occurs within these specific contexts and how it addresses the systemic problem of fragmentation.

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